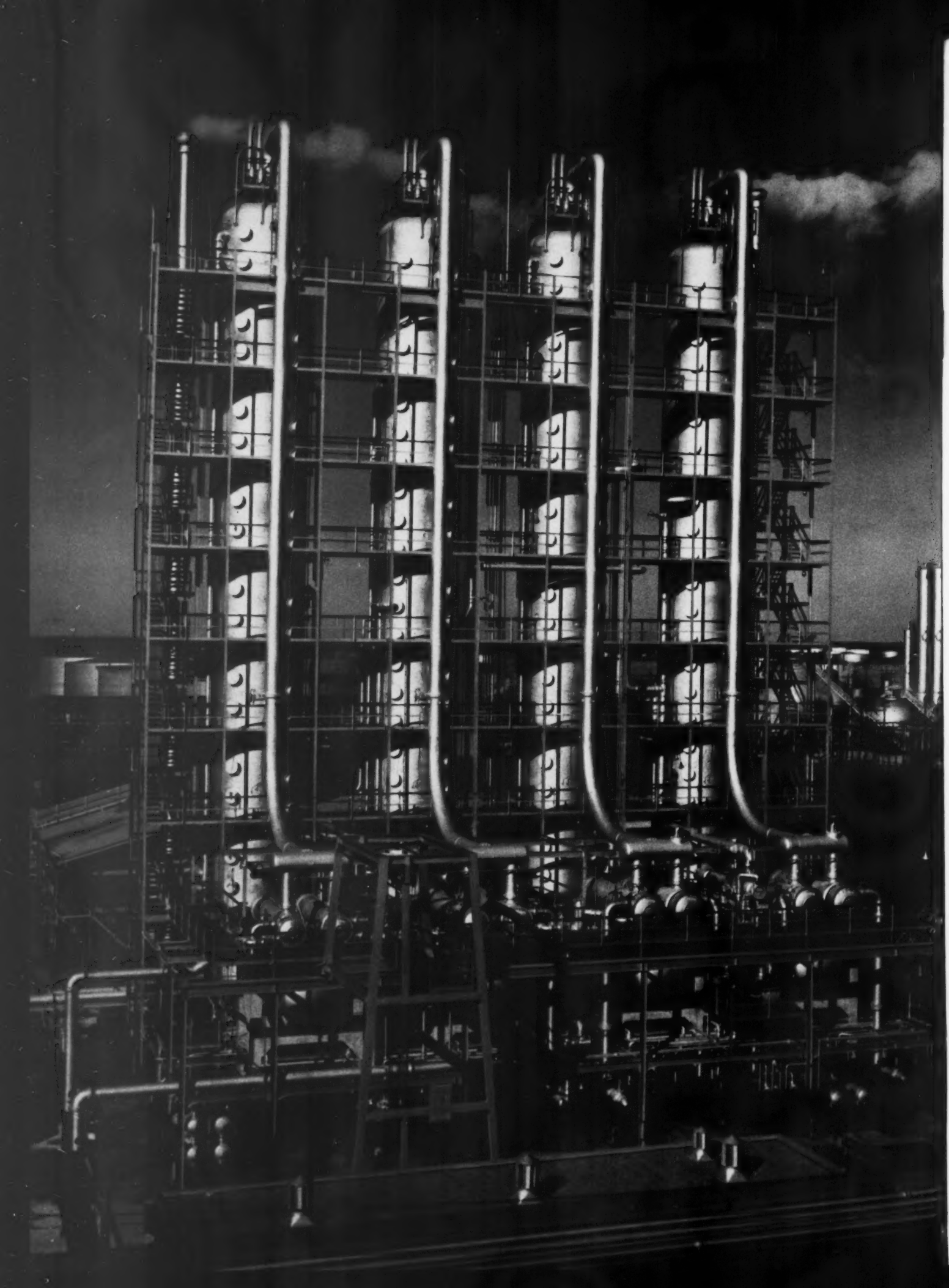
Swapping Hats *by Mark Storm*

The HUMBLE WAY

JANUARY-FEBRUARY 1954



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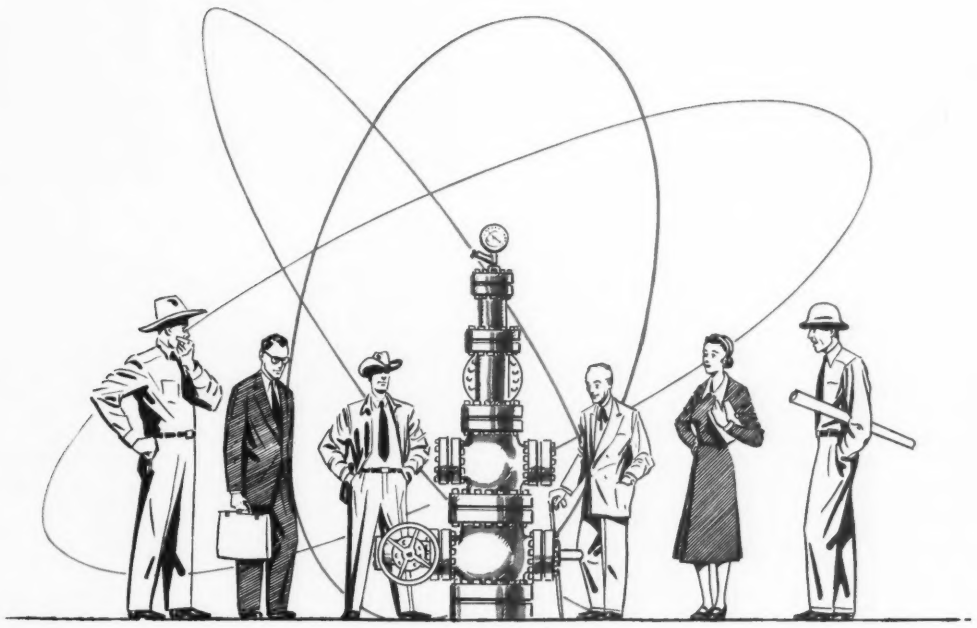


They Found it Wise to Unitize

MORE than nine million barrels of high-gravity crude oil—oil which may never have been made available to the consuming public—will be saved because a large number of people with interests in the Fort Chadbourne Oil Field in West Central Texas chose to pool their interests and work together for conservation.

This was no ordinary group of people drawn together by casual interests. Here was a diverse group, ranging from rugged individualists, to professional investors and to loyal corporation employees and executives. Here were big and small ranchers; major and independent oil operators; small and large "working interest" owners; heirs of landowners; and far-flung professional royalty owners. There were, in fact, 11 operators representing about 55 investors or working interest owners, and 146 royalty interest owners.

Yet this divergent group, each pulling in his own direction for his own benefit, found a common ground for cooperation—their mutual concern for conservation of oil and gas. And though their path was long and not all palm-strewn, they succeeded in making a real conservation achievement for the good of all and for the gain of the consumers.

How was this achieved? What did it involve? How will their cooperation result in recovery of additional oil and gas?

The answers to all of these questions are largely bound up in a process known as "unitization."

Briefly, unitization means that operators and royalty owners in a field join in a program designed to operate the field or a reservoir therein as a unit and to allot to each participant a percentage of the total production from the field or reservoir unitized. When conditions in an oil reservoir are such that conservation measures, like pressure maintenance, work most effectively when applied to the field as a whole, unitization makes such a program possible.

This is what happened at Fort Chadbourne. The field—one of the largest in West Central Texas with a proven area of about 30 square miles—is now being operated as a unit in which each interest owner shares, equitably. The Humble Company, discoverer and major operator in the field, is Unit Operator on behalf of all interests.

Other operators participating in the

Baytown Refinery's naphtha fractionation unit, left, makes **cyclohexane,** an oil material used in the manufacture of nylon. (See "The Struggle to Stay Ahead, page 16.)

Surveyor checks route for new gas injection line. Right, Paul McFadden, Humble district superintendent, obtains permit for line from C. H. Wylie, Fort Chadbourne royalty owner. In background is Lone Star's gasoline compressor station.

achievement are Stanolind Oil and Gas Company, G. W. Strake, Currie and Wylie, Greenbrier Oil Company, N. P. Powell, Hanley Company, Burdell Oil Company (whose interest has since been purchased by N. P. Powell), King Oil, Inc., and Lester and Duffield, Inc.

And who is the winner? Operators, working interest owners, royalty owners—every participating interest in the field, plus school districts, counties, and the state. All participants will share proportionately in the income from the extra oil to be recovered, with added profits from gas conserved and liquid hydrocarbons stripped from the gas.

But the ultimate winner through these people's cooperation is the general public! In this oil-powered age, 9.5 million barrels of oil is a substantial contribution to our petroleum reserves.

Like most important advances, the conservation program in the Fort Chadbourne Field was not easily achieved. Certainly there were disagreements. There were disagreements about the type of conservation program for the field; there were disagreements about how they should be accomplished; there were many disagreements on determining a fair basis for unitizing.

But there was never disagreement in *principle*—all parties agreed from the first that a conservation program was desirable and necessary. It was this basic interest in conservation which led all interests, despite different viewpoints and knotty technical problems, to a solution which left all agreed and in a good humor after almost three years of negotiations.

Even when the field was shut in for more than a year by the Texas Railroad Commission, the state's regulatory body for oil and gas, the operators did not challenge the order, but continued to work toward an acceptable conservation program.

These voluntary negotiations involved many factors: the technology of conservation practices, a state regulatory body, state laws, federal tax laws, the operators, working interest owners, royalty interest owners, and many complicated factors in the Fort Chadbourne Odom Lime reservoir itself.

For a better understanding of the process which implements such conservation achievements, these factors should be briefly reviewed.

Conservation in oil fields, of course, is aimed at recovering the greatest practicable amount of oil from each reservoir with the least possible waste. We know today that this depends on using effectively the reservoir's *drive*. This drive may come from water entering the reservoir, from an expanding gas cap, or from expansion of gas dissolved in the oil, flushing the oil through tiny spaces in the producing rock to the well bore. Once this drive is exhausted, remaining oil cannot be recovered by natural means.

BUT industry scientists in recent years have learned new ways of supplementing the effectiveness of drives in oil reservoirs. These are known as pressure maintenance and secondary recovery methods, and consist of maintaining drive by pumping gas or water *back* to the productive zone under high pressure. These "transfusions" have extended the lives of oil fields as dramatically as modern medicine has extended the life-span of man.

In some cases pressure maintenance effects maximum recovery by injection into the center of the field, sweeping oil outward; or around the outside or periphery of the field, sweeping oil inward. But obviously, in these cases oil is displaced and moves across boundary lines. Thus unitization, or exchanging of individual properties for a share of the whole, often becomes necessary to protect the interest of all concerned.

Charged with approving the practice of these conservation principles in Texas oil and gas fields is the Railroad Commission of Texas. The Commission may not only regulate production, but has even shut in fields to prevent waste.

Until a few years ago, however, the Commission was not authorized to approve of one important conservation tool—unitization.

This situation was remedied in 1949 with the passage of the Permissive Pooling Law. Subject to the approval of the Railroad Commission, this law authorizes *voluntary* unitization agreements to (1) establish pooled units necessary to effect secondary recovery operations, and (2) to establish pooled units and cooperative facilities for conservation and utilization of gas.

Under the law, then, accomplishment of unitization falls to those most directly concerned: working interest owners, royalty owners, landowners, and others with interests in the field.

The working interest owners, of

course, have the greatest stake in unitization. They must make the necessary technical studies, devise a sound program, coordinate negotiations, and bear the entire expense of the program.

But the royalty owners' contribution —consent and cooperation—is just as important. The royalty owners of any particular tract share in the unit on the same basis as the working interest owner of the tract, and their consent is equally necessary. Since the working interest owner normally has seven times as much interest in the mineral rights as the one-eighth royalty owner, it is only logical to assume that what is best for the operator is best for both. Therefore the two are usually cooperative partners in unitization for mutual benefits.

At Fort Chadbourne, this was literally true. A rancher—largest single royalty owner in the field—was also a working interest owner on part of his own land, and hence took part in negotiations at both levels.

All of the above elements, then, figured in the Fort Chadbourne conservation achievement, as they must in any unitization program.

But the final achievement was still far in the future when a Humble rig, nine miles from nearest production, probed the earth below a large ranch northwest of Winters, Texas, in 1949. After 51 days of drilling, the bit encountered a highly promising limestone formation. Tests began from 5436-54 feet, and the promise was fulfilled: the well flowed 345 barrels of oil per day! Thus the Fort Chadbourne Field—so called for a nearby Indian fort established in 1852—was born.*

SUDDENLY the sparsely settled section of Coke and Runnels Counties sprang to life. Heavy trucks rumbled along new roads through cattle pastures as drilling rigs moved into location. Humble began step-out tests on its large lease-holdings, and the night horizon glowed with light as other operators with nearby acreage also started tests.

Six months after the discovery a dozen wells were producing in the new field, and Humble geologists and engineers estimated that at least 10,000 acres would prove productive!

With a major new field so indicated, the Company made a decision to open conservation studies of the reservoir at once. The importance of the prompt beginning of these studies while the field was still new was not to be realized until much later. As will be seen, a year or more of delay would have dealt serious effects to the field's life.

An extra force of petroleum scientists arrived at the field to learn by every means possible the nature of the oil reservoir below. New wells were cored, logged, and carefully tested; cores were studied and analyzed; careful reservoir pressure tests were made; relationship between wells and pressure and production rates was scrutinized; gas-oil ratios and many other factors were considered. Information came not only from Humble wells but from outside properties; many operators, interested in the conservation study, furnished data for the survey.

Part of the work was concentrated on separator conditions. This study of the equipment which separates gas from produced oil revealed that operation at higher pressures would result in recovery of about two and a half extra barrels of liquids for every 100 barrels of oil produced—an important conservation contribution in itself. Two-stage separation, the study showed, would result in recovery of yet another 1.93 barrels. This information was furnished to all operators, and became the field's first conservation measure as several put the methods into effect.

Other data gathered in the study were also highly significant. They showed, among other things, dissolved gas drive and low porosity and permeability of producing formation—factors which usually mean low primary recovery and rapid rate of depletion. They also showed high-shrinkage oil—oil with a high per cent of light fractions—which usually means that the field will lend itself to gas injection. The study showed, too, that the Fort Chadbourne Field was one continuous, interrelated reservoir, with no faulting.

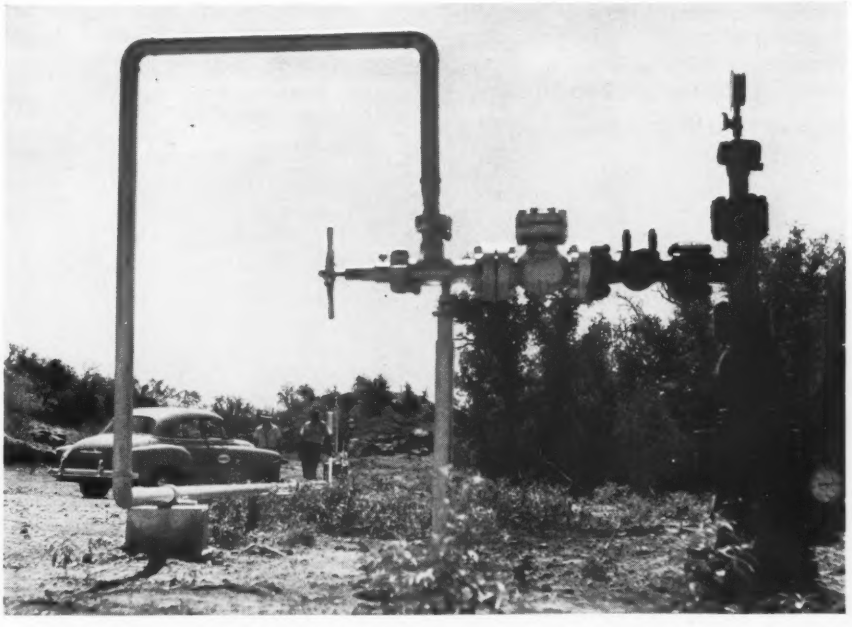
All of these factors pointed to pressure maintenance by injection of gas. It would not only answer the immediate question of conserving flare gas, for which there was no outlet, but would also solve the long-range problem of increasing recovery of oil by bolstering the natural drive.

BUT other conservation methods had to be considered too, for a comparison of economic factors as well as maximum recovery. This was done.

In January, 1951, the geologists and engineers completed their work and handed in these findings:

That a gasoline plant to process casinghead gas would be profitable and would result in recovery of a large amount of liquid hydrocarbons.

That peripheral gas injection, which



Fort Chadbourne gas injection well. Under unitized pressure maintenance, this West Texas field is expected to produce an additional 9.5 million barrels of crude oil.

* See The HUMBLE WAY: "Fort Chadbourne Field," Nov.-Dec., 1950; "Wells on Stilts," July-Aug., 1951.

would require unitization of the field, would result in maximum recovery of oil and conserve gas for future sale.

That all interests in the field would share in a greater ultimate income from this program than from any other.

Company management, reviewing these recommendations, immediately decided to present the information to other operators in the field and to begin discussions toward developing such a cooperative program.

Meanwhile, the operators had already begun considering conservation matters at their first meeting on Nov. 5, 1950, in Houston. The need for gas injection and prospects for a gasoline plant were discussed even at this early date.

LATE in January 1951 the operators again gathered to discuss conservation matters, and to hear the results of the preliminary reservoir study. All operators were generally interested, and the cooperation which was to continue throughout the Fort Chadbourne story began with the appointment of temporary committees to review the Humble work and to make a study of gas conservation, pressure maintenance, unit operation, and gasoline and compressor plant matters.

So developed the collection of a formidable mass of information on a single oil field. The intensive study and evaluation work were to be continued for more than two years, and is still continuing under unitization.

The operators' temporary committee reports, when completed, generally agreed with the Humble work.

These reports were discussed at an operators' meeting on March 6, 1951, and an outline of a possible unitization agreement was reviewed. Detailed calculations for the entire field and for each operator on four different methods of operations were presented. Unitized pressure maintenance and gasoline plant operations were shown to be the most beneficial of all methods, both economically and conservation-wise.

At this time no operator opposed unitization and all wanted more information, together with definite proposals on terms of a contract. An engineering and geologic committee was assigned to develop factual data as a basis for a unit participation formula.

The committee opened its task almost immediately. After further study, it recommended that participation in the unit should be on the basis of gross acre feet of producing lime; that weak wells should be penalized; and that allowables should be reduced to conserve gas and oil for greater future recovery.

A joint operating contract was prepared including these provisions, and came up for discussion at a meeting on June 28, 1951. Here, for the first time, was a concrete proposal in specific terms. And here, as might be expected, began the disagreements.

In general, five operators favored the contract; two were undecided; and three now took the position of vigorous opposition.

But agreement in principle continued—all operators except one voluntarily agreed to request the Railroad Commission to cut daily allowable from 102 to 80 barrels per well until a conservation program could be worked out. This request was made at an MER (maximum efficient rate of production) hearing called by the Railroad Commission on August 30, 1951, and was later approved.

PROGRESS toward unitization was slow through the last months of the year, but two important events occurred early in 1952:

First, the Lone Star Producing Company made a firm offer to construct a gasoline plant and high pressure gas compression facilities in the field.

Second, the Fort Chadbourne Field was shut in by the Railroad Commission on Feb. 1, " . . . until such time as the operators in the field can show the Commission either (1) that pressure maintenance is not feasible in this field or (2) that pressure maintenance is being undertaken in a diligent manner."

So the operators' income from the field was totally cut off, but their efforts toward a solution continued without challenge of the order. The cooperative studies and meetings went forward at an accelerated pace, and the "give and take" process of working out a satisfactory agreement progressed.

But the work was not all confined to the operators' joint committees. Each of the operators, in turn, was doing evaluation work on his own, and checking the results of the committee work. Literally dozens of people participated in the program. In the Humble Company, for example, all of these groups contributed to the Fort Chadbourne unitization: management, petroleum engineers, reservoir engineers, geologists, civil engineers, landmen, lawyers, accountants, and clerks—people in the Winters District, North Texas Division, and Houston office; in the Exploration Department, Production Department, Law Department, Crude Oil Department, Gas Division, Proration Division, Accounting office, and Reproduction Section. The Aviation Division contributed too, flying personnel thousands of miles to the many meetings and hearings.

First conservation measure in the Fort Chadbourne Field was use of two-stage separation equipment like this to recover "wet" fractions from casinghead gas.

Four members of Fort Chadbourne Field Engineering and Geologic Committee, which made detailed studies of the field before unitization, discuss equipment.

Much of the work, of course, centered around the question of equity in the field. How would the interest of all 55 working interest owners and 146 royality interest owners be divided on a fair basis *agreeable to all?* Furthermore, how would cost adjustments be made for difference in spacing of wells, equipment, camp and other facilities? Some of the complex reservoir factors which figured in the solution included production rates, thickness of pay, gas-oil contact, oil-water contact, gas-oil ratios, bottom hole pressures, and others. Were these tough questions to agree upon? Yes—for a slight difference would make a difference in each operator's equity in the field.

Yet progress toward agreement continued throughout 1952, and in November all operators for the first time voted in favor of unitization subject only to final agreement on equities and development of satisfactory contracts.

The end of the year brought several developments favorable to a final settlement. One of the operators approved a different approach—one more acceptable to the other operators—in figuring the unit participation formula. The limits of production were almost completely defined by drilling. And the Lone Star gasoline plant and compressor facilities were nearing completion.

THEN, on January 14, 1953, seven operators representing 87 per cent of the working interests voted in favor of unitization on the basis of a participation formula of gross acre feet of producing lime modified by the productivity of individual wells and bottom hole pressure. Tracts underlain entirely by gas were to enter the unit in proportion to their value if underlain by oil. A legal subcommittee was named to draft final contracts.

At subsequent meetings questions of controversy were settled by head count of votes among the operators, and a substantial majority voted in favor of Humble as unit operator.

Reopening of the field was speeded up when Humble and Stanolind Oil and Gas Company offered to inject on their properties through their own injection wells all other operators' gas until unitization could be effected. This offer was accepted, approved by the Railroad Commission, and the field was re-opened late in March.

The seventh and final revision of the contracts was approved, printed, and distributed for execution on May 15, and a Railroad Commission hearing was called for June 2 for approval of the unitization project.

All operators now began contacting royalty interest owners for their approval of the Unitization Agreement. In some cases this meant traveling hundreds of miles to locate owners, and it also meant many conferences and explanations of the agreement and of the benefits of unitization.

A majority of the royalty owners was still unsigned at the Commission hearing on June 2, and the hearing was postponed until June 29.

On this date Humble, acting as spokesman for the operators, was able to inform the Commission that 91.5 per cent of the working interests and 95.7 per cent of royalty interests in the proposed unit area had approved the agreement. Before the hearing was over another operator joined in the agreement, increasing the signed working interests to more than 99 per cent! Only one operator with two limited capacity wells elected to remain outside the unit.

Testimony further showed that all interests in the field, whether within or without the unit, would be fully protected under the agreement; that an additional 9.5 million barrels of oil would be recovered under unitized pressure maintenance; that the additional income would be shared equitably by all owners of interest; and that provisions allowed inclusion of tracts outside the unit if such tracts were developed.

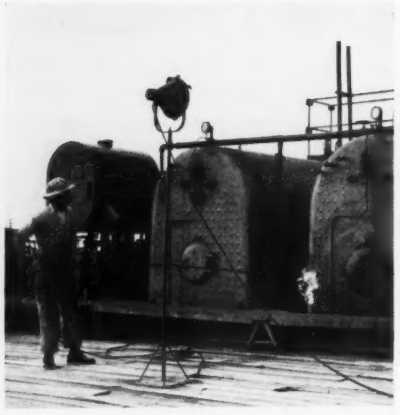
On July 13, the Railroad Commission issued an order approving the Fort Chadbourne Odom Lime Unit.

THUS the Fort Chadbourne conservation efforts ended in solid accomplishment, with virtually all parties agreed. Today the field is in full unit operation, with the hum of its gasoline plant and the presence of high-pressure gas lines and injection wells testifying to a full-scale conservation effort. As of September, its 296 producing wells had a combined allowable production of about 17,125 barrels per calendar day. With pressure maintenance, the field promises to remain at a higher level of production for several years, gradually decreasing over a period of some 10 years. Tests are to begin shortly on water injection, another conservation measure which may be started if it proves practical.

But the story might have been different. If conservation studies had not started early to point the way to unitization, and if the field had been produced under primary methods for two more years, engineers estimate that *at least half* of the additional oil to be recovered would have been lost. In three additional years, the reservoir pressure would have been so reduced that *all* of the extra oil which will now be recovered would have been left in the earth.

Through unitization, this story was changed to the benefit of all. Truly, they found it wise to unitize!

STEAM



Cloud of steam comes billowing from boilers as the fireman "blows them down" to get rid of scale and sediment. Boilers are usually blown down once every hour.

Lighting boiler, fireman stands to one side, pokes torch through firebox door.

Steam rigs are meeting some stiff competition, but in many areas they are still going strong

"STEAM," the tool pusher said almost sadly, "is slowly going out of the picture."

He chomped down on his unlit cigar and nodded toward the rig's boilers, standing four in a row like iron horses hitched to a picket line.

"It's all a matter of costs," he went on, "a matter of feeding those boilers. Fuel is a big expense these days, and in some places even water is higher than a cat's back. I hate to say it, but the power rigs—those with gas or diesel engines—are gradually taking over."

This loyalty to the steam rig, the "old pro" of drilling, is easy to understand in view of its past accomplishments. Steam ushered in the Age of Oil (a six-horsepower steam engine helped Drake churn his way to fame) and it was steam that drilled most of the half a million wells now producing oil in this country. It is hardly surprising that many an oilman should feel a twinge of regret from the current trend to other kinds of power.

But to write off the steam rig as nothing more than a fading champion with a ravenous appetite would be a little like that premature report of Mark Twain's demise: somewhat exaggerated. When it comes to versatility and flexibility, say many engineers and drillers, steam power is still second to none. And in areas like the Gulf Coast, where water and fuel are in abundant supply, steam is still going strong and will be, probably, for years to come.

The pressure of competition, however, has worked more than one change on this many-muscled veteran of the oil fields. To see that, one needs only contrast the steam power of yesterday with that now in use.

It was a stirring sight, the old-time steam rig, especially on a frosty day. You could see it from miles off, the misty plumes from exhaust pipes leaping and tossing above the derrick. Up closer, you could hear it, too. It splintered the air with the din from its engines—a croupy barrage of *chow-chow-chows*. Even on standby it was likely to snort and hiss like a caged dragon.

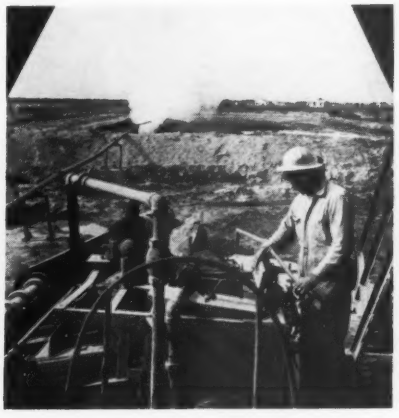
All this was mighty picturesque, but highly inefficient. Great amounts of steam escaped into the open air, a terrific waste of energy-laden heat.

It is small wonder, then, that fuel was a problem even in those days. A Spindletop historian tells how Peck Byrd, fireman on the Lucas well, had to stoke his boilers with watersoaked logs in an effort to keep up steam. On another well the operator got so hard up for fuel he had to trade his diamond stickpin for firebox oil. When that ran out, he bought more with his watch. You also hear tales of canny farmers buying an interest in "poor boy" wildcates with a few loads of cordwood.

Water was not so much of a problem. There were times when a barrel

Steam around the rig

Checking water, he notes level shown on gauge, confirms it by opening try-cock.



Jetting cuttings, steam sweeps rock chips from shale shaker to pit back of the rig.

of water cost more than a barrel of oil (at Spindletop: $6.00 for water, three cents for oil), but often there was a pond or creek handy nearby. If these sources were not available, a water well could be dug—still a common practice. But unlike today, when water is likely to be thoroughly analyzed before being converted to steam, the water was used as was. Some of it played hob with the boilers, but in those days it was hang the scale and sediment, full steam ahead!

These early boilers, incidentally, were usually poorly insulated. Let them be drenched by a sudden rain and the steam pressure would drop below the minimum working level. "Whenever it came a shower," one Humble man recalls, "we'd head for the tool house and wait until the fireman could get up more steam."

There were also other drawbacks to the old-time rigs. With so much steam escaping into the air, and then condensing, it was like working in a heavy dew. At times, when the wind shifted toward the derrick, a smother of steam would fog over the entire area, making it difficult and dangerous to carry on drilling operations.

And then there was the noise. "In the old Conroe days," says one engineer, "it sounded like hundreds of those little sawmill engines were running around loose back in the woods." Some drillers, though, seemed to have the happy faculty of ignoring this riot of sound. They would attach "barkers" (extensions to the exhaust pipes) to add even more decibels to what was already a bedlam. This helped them, they said, to tell at a distance if their engines and pumps were running all right.

The modern steam rig is a more efficient, more powerful, and much quieter layout of equipment than that of old.

Except during a blow-down to rid the boilers of scale and sediment, and except for an occasional leak, you don't see much steam around a rig nowadays. Even the exhaust is piped off and put to useful work. Once wasted, this tired steam now helps to heat boiler feedwater and to provide draft for the fireboxes. The latter use alone, say the engineers, can cut fuel costs 15 per cent.

Boiler capacity also has been boosted, a direct and necessary result of today's deeper drilling. At 10,000 feet, for instance, a rig has to lift a string of pipe weighing more than 200,000 pounds. On a job like that, the 30-horsepower boilers of a half century ago could have all the admirable traits of The Little Engine That Could of nursery story fame and still never get off dead center. It is a different story, though, with the 150-horsepower boilers now used on an extra-heavy land rig.

If silence is golden, the steam rig has also become more valuable on that score. The devices that conserve the exhaust have effectively muted the thunder of the engines. Quietness in this case is synonomous with efficiency.

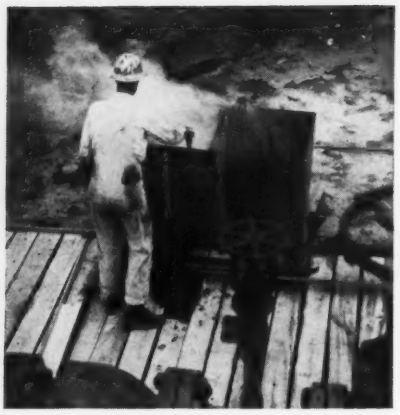
As with any other means of power, steam around the rig serves three basic purposes. It rotates the drill stem, it operates the hoisting equipment, and it circulates the drilling fluid. To the latter function, however, goes the lion's share of the available energy. More than two-thirds of the rig's steam power may be required to operate the slush pumps.

Steam provides many auxiliary services, too. It runs the rig's electric generators and air compressors. It jets cuttings into the reserve pit. It powers the mud-mixing machine, the coring reel, and the shale-shaker. It closes the blowout preventers. And in addition to these duties, it carries out a variety of unusual assignments.

Typical layout of a steam rig has slush pumps near derrick, boilers 150 feet away.

Fireman jets steam into bucket of water to get the makings for a pot of coffee.

Grating of pipes, filled with steam, can add bit of heat to a chilly derrick floor.



Crewman shows how rig's "steam laundry" easily routs dirt and oil from clothes.

Air lift for rig's water well (above) is derived from steam-powered compressors.

Hungry for a steak? "The top of a boiler is the best place in the world to cook a steak," claims one oil field gourmet. Or how about a cup of coffee? The fireman can brew one in a jiffy by jetting steam into a bucket of water. Would your work clothes put a laundryman to flight? Steam hosed into a tub of water will change it immediately into a boiling cauldron and clean the clothes if anything can.

Steam also provides the crew with other creature comforts. Small turbines, for example, power the bug-blowers. These are large fans, strategically located, designed to protect the derrick floor from insect forays. And in cold weather there are heaters, usually nothing more than coils of pipe tied into a steam line, that provide a measure of warmth. ("In the old days," says a driller, "I ruined a lot of shoes trying to get my feet warm in the firebox.")

In the final analysis, though, it is the job the steam rig is able to do in the drilling for oil that will determine its future. At that job, as of now, it seems to be doing right well in many areas. But whatever the future holds, you will probably always be able to find drillers and engineers who agree with Engineer-Novelist William McFee:

"Steam engines are very human. Their very weaknesses are understandable . . . They have arms and legs and warm hearts and veins full of warm vapour. Give us steam every time. You know where you are with steam."

Fireman keeps a close watch on all equipment around boilers, should never be away from his post over 15 minutes at a time.

Driller joins in a check of rig's compressors. Air serves such purposes around rig as lifting water and operating air slips.

The Long Road to San Jacinto *by E. M. Schiwetz*

RETREAT TO VICTORY

All the way to San Jacinto, troubles plagued Sam Houston. Beset with bad news and worse weather, he at last turned retreat into victory, winning in the space of 18 minutes one of the world's decisive battles

THE smoke of battle had hardly cleared from the field at San Jacinto before the great debate began: Was Sam Houston a great general? Or was his victory after the long retreat just a piece of sheer luck? Did he mean to fight at all? Or was his eastward march designed to keep out of harm's way and leave a convenient escape hatch open?

These and other hotly debated issues have occupied historians and military strategists for more than a century. One is best equipped to answer for himself after the facts are examined:

When Sam Houston arrived at Gonzales on the afternoon of March 11, 1836, his first inquiry was about the Alamo. Unsupported news had come that the Alamo had fallen on March 6 and all its garrison had been put to the sword.

Houston needed verification. He sent out a scouting party to get close to the Alamo and glean what information it could. Later, to round out that busy first day, Houston dispatched orders to Col. James Fannin at Goliad, directing Fannin to blow up Presidio La Bahia and retreat. By sunset of the 11th, Houston had time to contemplate his "army," some 374 raw and undisciplined troops including a company under command of Capt. Moseley Baker, who had already seen action in 1835 at the Battle of Gonzales and the Grass Fight at the siege of Bexar.

Tragic and definite news of the Alamo's fall reached Gonzales on the morning of March 13. On that day, Mrs. Almaron Dickenson, whose husband had been killed with the rest of the garrison, arrived in town with her daughter. Her report that an enemy column was marching on Gonzales caused immediate panic.

That night, Houston gave the order to evacuate the town. Two cannons were sunk in the Guadalupe River, military stores that could not be taken along were destroyed, and by midnight the little army (still no larger than 400 men) began its long retreat. A few men were left behind, charged with the duty of blowing up ammunition caches and putting Gonzales to the torch.

Through the dismal morning of March 14, the gloomy little band trudged eastward some 11 miles to Peach Creek. There exhausted men threw themselves on the ground and slept beside their weapons. Some reinforcements arrived, but as the army moved out again on the 14th, General Houston surveyed it sadly from a distance, depressed by what he saw. Staring moodily at the thin column, barely visible on the vast prairie, he turned to his adjutant and is reported to have said: "Hockley, there is the last hope of Texas." He would have occasion to feel even more forlorn before the retreat was ended.

By sunset of March 14, the army had made its way to the Lavaca River. Here it halted for rest and then continued

Editor's note: THE HUMBLE WAY acknowledges with sincere gratitude assistance received in the preparation of this article from Hobart Huson's *The San Jacinto Campaign,* Dr. N. D. Labadie's account of the San Jacinto campaign in the *Texas Almanac* (1859), and L. W. Kemp's article in *The Handbook of Texas,* II, 554.

eastward, reaching the Navidad River about one o'clock on the morning of the 15th. While the men rested until morning light, reinforcements from the Brazos arrived. Houston sent to Brazoria for artillery and ammunition, and ordered all troops in that area to join him on the Colorado.

Thus far, Houston's army had followed the main road between Bexar (San Antonio) and San Felipe. On leaving the Navidad, however, Houston ordered his column to turn left and follow the little-used old La Bahia Road, which led to Burnham's Ferry on the Colorado River near present La Grange. Capt. Moseley Baker strongly protested this strategy, but Houston kept his patience and held his tongue.

As a result of the sudden turnoff on the La Bahia Road, the Texan army was by-passed by a pursuing column under General Sesma. From this time on, Houston was always *above,* or north of, the Mexican army. The way for a march to the Sabine and safety in the United States lay open, should he choose to take it.

Burnham's was reached late on March 17. The Texans, who camped that night on the west side of the Colorado, now numbered some 600 men.

On the 18th, rear guards came up with some of the refugee families that had been clogging the roads leading out of Texas. The famous "Runaway Scrape" had begun. After he ordered these families across the river, Houston received an interesting piece of news.

Santa Anna, Houston now learned, had been undecided after the fall of the Alamo whether to remain in Texas or return to Mexico. Fannin's surrender at Goliad convinced the Mexican commander that the war was over. He arranged to leave for Mexico, making no secret of his plans. Houston did not know that he had changed those plans until April 11, when Joseph Powell brought word from Old Fort (present Richmond) that Santa Anna was on the Brazos.

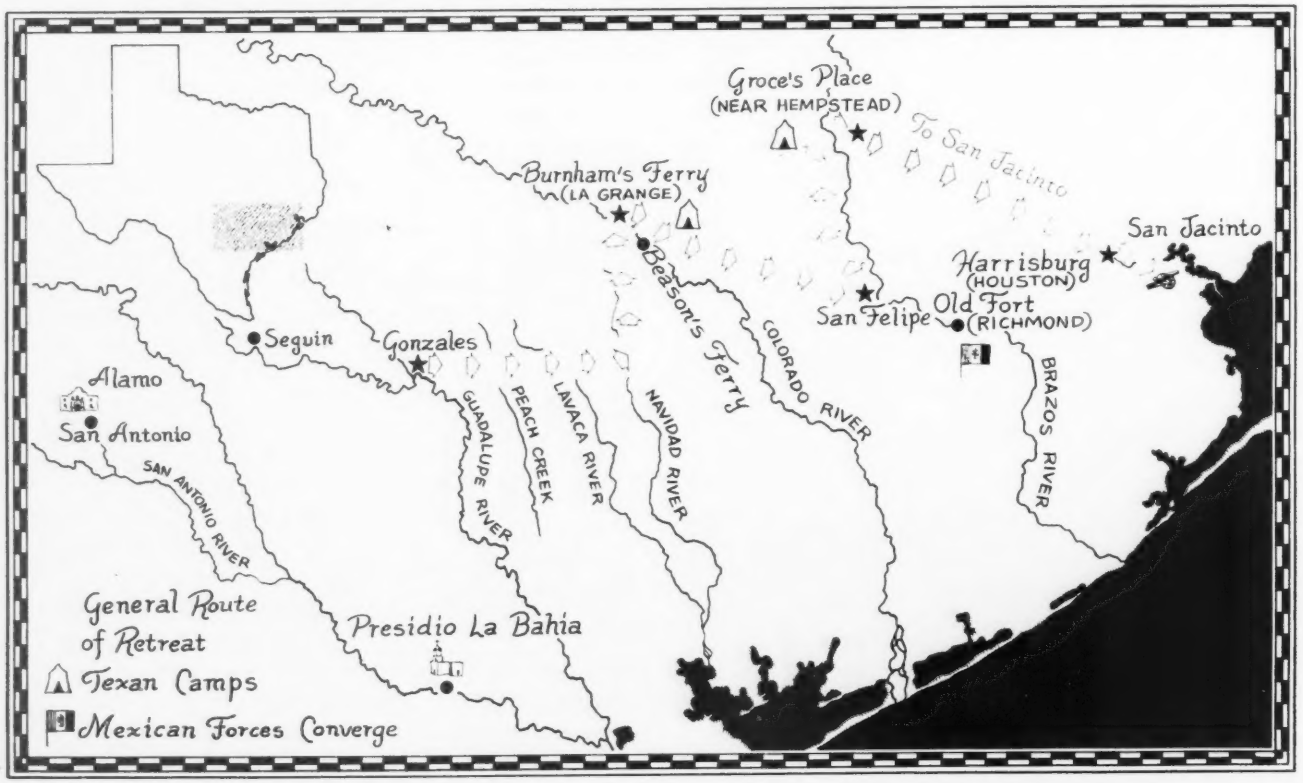
On March 20, the Texans crossed the Colorado at Burnham's, burning buildings and the ferry itself after they had crossed. Again, Baker protested to no avail.

The Texans now marched down the east side of the Colorado to a point opposite Beason's Ferry, where they made camp. Here they were joined by the "Liberty Company," some 70 or 80 volunteers from Beaumont and Liberty.

Beason's was the central of three crossings in that area. The Deweese crossing lay about three miles above; the Atascosita crossing about four miles below. By either or all of them, the Mexicans could pass to San Felipe. A log redoubt was thrown up to guard Beason's crossing; detachments of soldiers were sent to bar the enemy's way across the other two crossings on the Colorado.

On March 20, scouts brought in a prisoner who yielded valuable information about the movements and strength of the pursuing column under General Sesma. Sesma's position was reported, with the warning that he might appear soon on the other side of the river. On the night of March 22, Sesma camped just a few miles from the Colorado, and on the 23rd, he appeared at the river in force. He was reinforced on the 24th with 675 troops under Tolsa, bringing the enemy's total strength to some 1400 men.

It appeared that Houston was forcing his pursuers to take the lower routes while he took the upper routes. It was sound



strategy, furthered by rainy weather that turned prairies into bogs and brought watercourses to flood-stage throughout lower Texas.

Sesma jockeyed for crossings. Finding the main crossing at Beason's strongly barred, he probed first at Deweese and then at the Atascosita crossing. Both ventures failed. Meanwhile, Houston was reinforced with regular troops under Teal, and with numerous other parties, bringing his force up to about 1200 men.

On March 25, Houston received word of Fannin's defeat and surrender. He suppressed the information, fearing it might affect his troops' morale or precipitate a major conflict prematurely.

On the afternoon of the 26th, after Houston's and Sesma's men had faced each other across the Colorado for three days without a major engagement, Houston gave abrupt orders to break camp. At dusk the Texans withdrew quietly—but left their campfires burning. They marched a good six miles before Houston allowed them to bivouac and "grumble themselves to sleep." At this point, the Texans were again reinforced, bringing their total strength up to about 1400 men.

Daylight of March 27 saw the retreat resumed. By this time, protests against Houston's leadership and overall strategy grew loud and vocal. Baker made no secret of his feelings: he was for deposing Houston before the day was out! Dark clouds of mutiny hung heavily over the grumbling column. But Houston gave his mutinous men no chance to carry out their ominous threats. He marched them 30 grueling miles that day, and by nightfall they were too tired to care who was in command. They had covered the entire distance between the Colorado and Brazos rivers and pitched camp a mile from San Felipe.

On the morning of March 28, Houston sent units into San Felipe. He had hardly done so when groups of men came to him, loudly insisting that he take them back downriver to fight Sesma. Their demands Houston ignored; their insults he chose not to hear. Then he gave a command that would have made an end of a weak and less determined leader—he called for a march *farther upriver!*

Enraged howls went up. Men threw down their arms in disgust. Most of them threatened not to move a step. Houston turned to his adjutant and remarked, "If subordinates refuse to obey orders, the sooner the fact is ascertained the better." Again he gave the order. This time, all but the companies under Baker and Martin moved sullenly to obey, muttering darkly as they went.

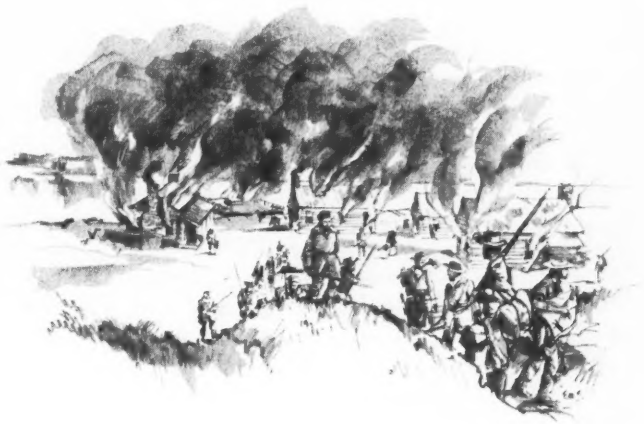
Seeing Baker and Martin standing fast, Houston resolved to put them to another use. He ordered Baker to defend the crossing at San Felipe and Martin to take his company downriver to Old Fort (Richmond) to defend the crossings in that vicinity. Both rebellious commanders consented to the new assignments.

Late on March 28 cold rains added to the general troubles and discomforts. It had been drizzling for hours; the ground was soggy and slick. As the army crossed Mill Creek, the gray skies opened and a cloudburst flooded upon them. Wagons and teams floundered in the morass; some became so mired that Houston and his officers pitched in and worked shoulder-to-shoulder to pry them out. Rain still poured relentlessly that night, but somehow the men got fires going and warmed themselves before cheery blazes.

The next day was spent laboriously hacking a way for wagons through the wild and uninhabited thickets above Mill Creek. It took all day to go three miles. On the 30th, only eight miles were made, with Houston and his men camping near the edge of the Brazos bottom. On the following day, they moved farther into the bottomland to a point near Jared Groce's place on the Brazos. During the past five days, Houston had lost from 400 to 500 men through desertion and special assignment. By the time he reached Groce's, he had no more than 900 troops.

On April 1, Houston selected as the spot for a permanent camp an elevated place in a thick grove of timber circling a clear-water lake. A trail had to be hacked through dense woods and brush, and space had to be cleared to make the campsite ready. Baker later took Houston to task for his choice of a campsite.

No sooner had the Texans gone into camp than the Brazos rose so high, swollen with heavy rains, that it made an island of the campsite. One of Houston's first acts was to commandeer the steamboat "Yellow Stone," then loading cotton at Groce's Landing. Thus he had a means of moving his men quickly across the flooded river, should the occasion demand.



Burning of Burnham's Ferry *by E. M. Schiwetz*

At Groce's, Houston put his army through rigorous drills and reorganized it completely. Sidney Sherman was placed in command of a newly-formed second volunteer regiment. Since Houston expected to receive cannon any day, he organized an artillery company. A medical corps was formed, and a field hospital established on the east side of the Brazos. It took no time at all to fill the new hospital; scores of men suffered from chills, fevers, and exposure.

Meanwhile, those well enough to remain on their feet underwent a thorough course of discipline. Rains poured on them, cold and dismal, drenching them to the skin and doing little to raise dejected spirits. Houston realized, however, the necessity of keeping his men busy.

From Groce's, Houston kept constant watch on the movements of the enemy. Sesma was still having his difficulties at the Atascosita crossing, downriver. Houston, for his part, was poised for mobile action. Though hidden from the enemy, he kept his lines of communication open. In this, he was blessed with as fine a group of scouts as ever served the

cause of freedom. "Deaf" Smith, Henry Karnes, and others of their calibre kept Houston well posted. Mexicans serving the Texan Army, such as Capt. Juan N. Seguin, a brilliant and able man, made it possible for Houston to make the most use of captured couriers and their dispatches.

Santa Anna Changes Mind

Santa Anna, having changed his mind about returning to Mexico, decided to leave at once for the front. His strategy was to converge his columns on the Brazos and unite the command there. If that strategy had been accomplished, the total strength of the central column would have been some 3,400 men.

On March 31, *El Presidente* and his staff left Bexar, accompanied by troops under General Vicente Filisola. When they reached Gonzales on April 2, they found a vanguard under Amat held up by floodwaters of the swollen Guadalupe. Impatiently ordering his troops to build barges and cross, Santa Anna and an escort of cavalry swam the Guadalupe and proceeded poste-haste to the Colorado. Reaching the Atascosita crossing on April 5, Santa Anna found that Sesma had crossed with his troops, but had left his baggage and artillery behind. Detailing men to build barges and float the material across, Santa Anna took 1200 of Sesma's troops and on April 6 began a march to San Felipe.

On April 7, Santa Anna undertook to cross the Brazos at San Felipe, but found himself turned back by high water and determined resistance from Baker's company. Mexican artillery, rushed up to shell Baker's position, roared away without success. An effort to build barges and float across in the face of Texan fire failed miserably. The thwarted Santa Anna quit his struggle at San Felipe on April 9. Taking 500 infantry and 50 cavalry, he went downriver to look for another, less hotly disputed, crossing. Sesma he left behind with the remaining troops.

On April 10, Santa Anna halted for rest and refreshment at the Elizabeth Powell farm. From there, he proceeded to Thompson's Ferry on the Brazos, about three miles above Old Fort. Martin's company defended the opposite side of the river, but his force proved too small to parry several thrusts at crossings in the vicinity. Dispersing his company, Martin and a number of his men started back to rejoin Houston.

On April 11, Santa Anna dispatched orders to Sesma and Filisola, directing them to join him at Thompson's. Sesma arrived on the 13th; Filisola on the 16th. It was at Thompson's that Santa Anna conceived the idea of an attack on Harrisburg. Hearing that the Texan government had taken up headquarters there, he thought it would be a brilliant, back-breaking stroke to capture and hang the whole group. With that in mind, he left for Harrisburg on April 14 with his staff and some 750 men. Sesma was ordered to remain behind with the other troops; Filisola was still marching toward Thompson's.

Bivouac for the Night *by E. M. Schiwetz*

Houston Moves Out

Houston and his army had remained at Groce's. Here, on April 6, conclusive news of the Fannin massacre reached them. A few stragglers who escaped the massacre began to filter in, eager to fight again. Though some deserted on hearing the tragic news of Fannin and his men, most of the army was whipped into a frenzy, inflamed with desire for immediate battle. It was difficult to restrain men thus spoiling for a fight, and Houston himself seriously considered giving battle at San Felipe. Counting his sick and ineffectives, faced with wholesale desertions, and mindful of the men on detached duty elsewhere, he decided against a major engagement at that time.

On April 11, Houston got his first conclusive evidence that Santa Anna had not returned to Mexico but was then on the Brazos and preparing to march on Harrisburg. This came from Joseph Powell, who had overheard Mexican discussions while Santa Anna was staying on the Powell farm. Houston suppressed this news, as he had suppressed the first news of the Fannin defeat, for fear of precipitating another panic. He called in Rusk and made plans to move out immediately—but kept the plans a strict secret.

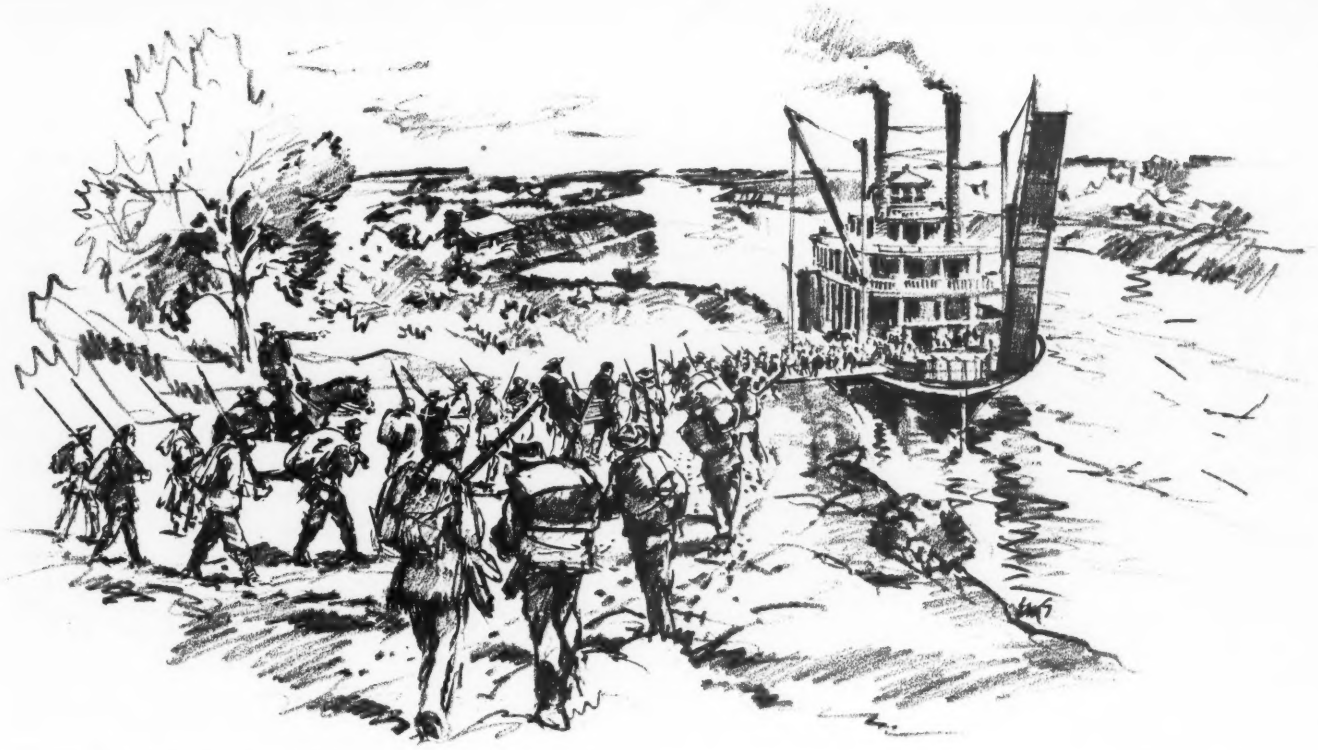
Using the impressed "Yellow Stone," Houston commenced on the morning of April 12 to move his troops across the Brazos. By the following afternoon, all were across, and Houston ordered the gallant crew to steam for their lives down the Brazos and seek safety in the Gulf of Mexico. Fortunately, as it turned out, the "Yellow Stone" made good its escape.

On April 14, the Texans made a night march to a point near present Hempstead. Shortly after, Houston received the cannon he had expected, the famous "Twin Sisters," a gift of the citizens of Cincinnati, crated and billed as "two pieces of hollow ware."

Houston found a number of refugee families camped nearby, and it was not long before the Baker and Martin companies rejoined him. On the morning of April 15, Moses, a servant of Jesse Thompson's, brought to camp an arrogant message from Santa Anna. In it, the self-styled "Napoleon of the West" impudently declared that as soon as he had caught the "land thieves" at Harrisburg he intended to come and smoke Houston out.

It was time for action. Houston prepared to move out at once. His column took the road on the morning of the 16th, but found its way impeded maddeningly by mud and refugee families who straggled along for protection. All of them were bound for the Sabine and safety.

Houston intended to take the road that branched to Harrisburg, but his men were not too sure he did not mean to retreat with others in the "Runaway Scrape." Baker and Martin grumbled, and the army muttered that if it passed



Crossing the Brazos on the "Yellow Stone" *by E. M. Schiwetz*

the Harrisburg Road, Houston would be deposed and a new leader elected.

Where the roads forked, the Texan column took the road to Harrisburg. Soldiers cheered, but a great wail went up from the refugees. These he sent on up the Trinity Road, with Martin and his company as escort. Through a quagmire of mud in a beating rain, the main army plodded its way toward Harrisburg.

It was about this time that Dr. N. D. Labadie, a surgeon in Houston's army, missed his medicine cart. It had been drawn by oxen owned by a Mrs. Mann, a refugee. Labadie, going back after the cart, found only its driver, who told him Mrs. Mann had taken her oxen with her up the Trinity Road. Vexed over the loss of oxen, Labadie asked his driver: "How could you give them up?" The fellow replied, logically, "Why, she showed fight when I resisted, presenting her pistol, and then I thought it most prudent to surrender." There was fight in the women, as well as the men, of early Texas.

After a night's rest, Houston resumed the march on April 17. Eighteen miles were made that day before the army halted about six miles north of Harrisburg, where it made camp for the night.

Houston's movements, now more of an advance than a retreat, had been well covered by scouts and spies, chief among them Erastus (Deaf) Smith. On the morning of the 18th, Smith captured and brought in Mexican couriers bearing dispatches for Santa Anna. It was learned from these that the *presidente* was near Lynchburg, on the San Jacinto River, and that Harrisburg had been burned. Labadie says the deerskin saddle-bags carrying the dispatches had belonged to Col. Travis and bore his name.

The Texans now made the six-mile march to Harrisburg. It halted nearby and concealed itself until the morning of the 19th.

Government Escapes

Santa Anna arrived in Harrisburg on April 15th. He found the town abandoned, except for three printers at work. They told him the government had fled to Galveston. Santa Anna immediately put Harrisburg to the torch.

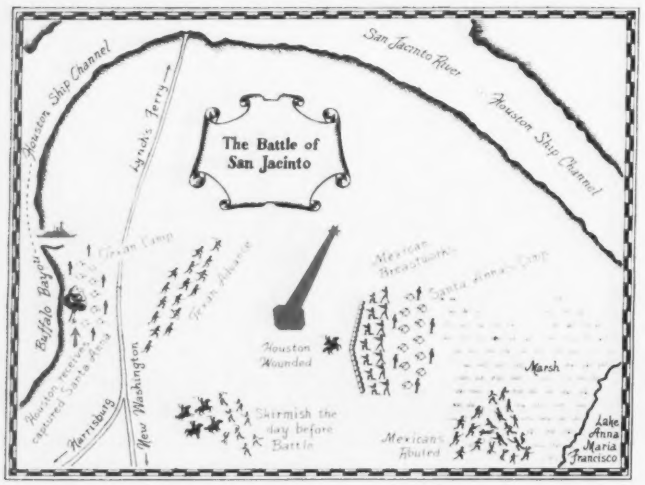
Col. Juan Almonte, with 50 dragoons, reconnoitered Lynchburg and New Washington and reported that Houston was retreating to the Trinity by way of Lynchburg. On the 16th, Santa Anna dispatched to Old Fort an order that Cos with 500 select infantry join him at Lynchburg immediately. On the night of April 17, Santa Anna camped at Vince's Bayou and on the following afternoon he marched to New Washington, on Galveston Bay.

Early on the 19th, the Mexican commander sent Capt. Marcos Barragan with dragoons to the Lynchburg crossing to keep a lookout for the Texans. On the morning of the 20th, Barragan reported that Houston was approaching Lynchburg. Santa Anna marched to meet him. The Mexican army arrived at what was to become the San Jacinto battlefield on the 20th, and went into camp. The stage was set for battle.

Houston Leaves Harrisburg

After he reached Harrisburg, Houston sent scouts out toward San Jacinto and Galveston Bay to find Santa Anna and learn, if possible, of his plans. Reports came that the *presidente* was at New Washington and was expected to go to Anahuac, crossing the San Jacinto at Lynch's Ferry.

Houston then ordered all baggage and his ill and ineffective men to be left at Harrisburg. On the night of the



18th, he and Rusk drew up a call to arms, announcing that the Texan army was "on the eve of battle." Riders were sent out with this proclamation, with instructions to rush to the army all volunteers they might find. On the morning of the 19th, Houston first ordered every man to provide himself with rations enough to last three days. Then he penned a few lines to his friend, Henry Raguet, declaring: "This morning we are in preparation to meet Santa Anna."

Capt. Karnes was ordered to remain with his scouts on the south side of Buffalo Bayou to protect the crossing of the army. About noon on the 19th, the Texans were ready to march. Before he crossed the bayou, Houston addressed his troops briefly: "The army will cross, and we will meet the enemy." By two o'clock on the morning of April 20, his army was within three miles of Lynch's Ferry, where it halted and slept. A few hours later the army gulped down a hasty breakfast and marched to the ferry. It was then drawn back into a belt of timber so near the ferry that it could block any attempt to cross. The orders were to remain concealed as long as possible; Mexicans did not definitely locate them until two o'clock that afternoon.

Provision for security of retreat was a matter of first concern to Houston after reaching San Jacinto. He thought first to build a floating bridge across Buffalo Bayou. Soldiers, however, refused to cooperate, saying they had come to fight; not to build bridges. Nonetheless, Houston quietly had two flatboats floated down the bayou during the night, providing for a measure of security if the battle went against him.

General Cos, obedient to Santa Anna's orders, passed through Harrisburg with about 542 reinforcements on the afternoon of the 20th. If the Texans posted across the stream were detected, the Mexicans ignored them. For their part, following orders, the Texans observed Cos' movements but made no demonstrations as his forces passed. Cos did not join forces with Santa Anna until the morning of the fateful 21st. After Cos had crossed Vince's Bridge, "Deaf" Smith destroyed it.

With the arrival of Cos on the 21st, Santa Anna's army numbered about 1300 officers and men. Texans had on the field from 920 to 1000, not counting the 350 or so left behind at Harrisburg.

On the afternoon of April 20, Sidney Sherman and a small group of his cavalry engaged in a skirmish with Mexican infantry, and a general battle was almost brought on. In this action, Pvt. Mirabeau B. Lamar so distinguished himself that he was made a cavalry commander the following day.

By Thursday morning, April 21, the Texans were eager for attack, but in a forenoon council-of-war, some Texan commanders favored remaining in their camp until attacked by the enemy.

Screening his movements by trees and rising ground, Houston quietly formed his troops in battle array about 3:30 that afternoon. The Mexicans were taking their customary *siesta,* or afternoon rest, and evidently Santa Anna thought it unnecessary to post lookouts.

Suddenly, with wild cries of "Remember the Alamo! Remember Goliad!", the Texans sprang upon the enemy. The battle was over in the incredibly short space of 18 minutes. It was almost unbelievable, but in that short time the Texans had killed 630 of Santa Anna's officers and men, and had taken the remainder prisoner. For their part, the Texans sustained only nine killed or mortally wounded, and only 30 less seriously wounded. Among these was Sam Houston himself, who received a ball in his ankle.

Santa Anna, seeing the battle lost, fled in the disguise of a common soldier. He was captured the following day and brought before Houston after Mexican soldiers had revealed his identity to his captors.

Capturing Santa Anna was a significant stroke for the Texans. Had he made good his escape, it is most likely that he would have reorganized his sizeable forces remaining in Texas and caused further trouble. As it was, he was glad to send orders to those troop commanders, directing them to take their men and leave Texas. Those orders were obeyed and the last threat to peace was removed. Texas was free.

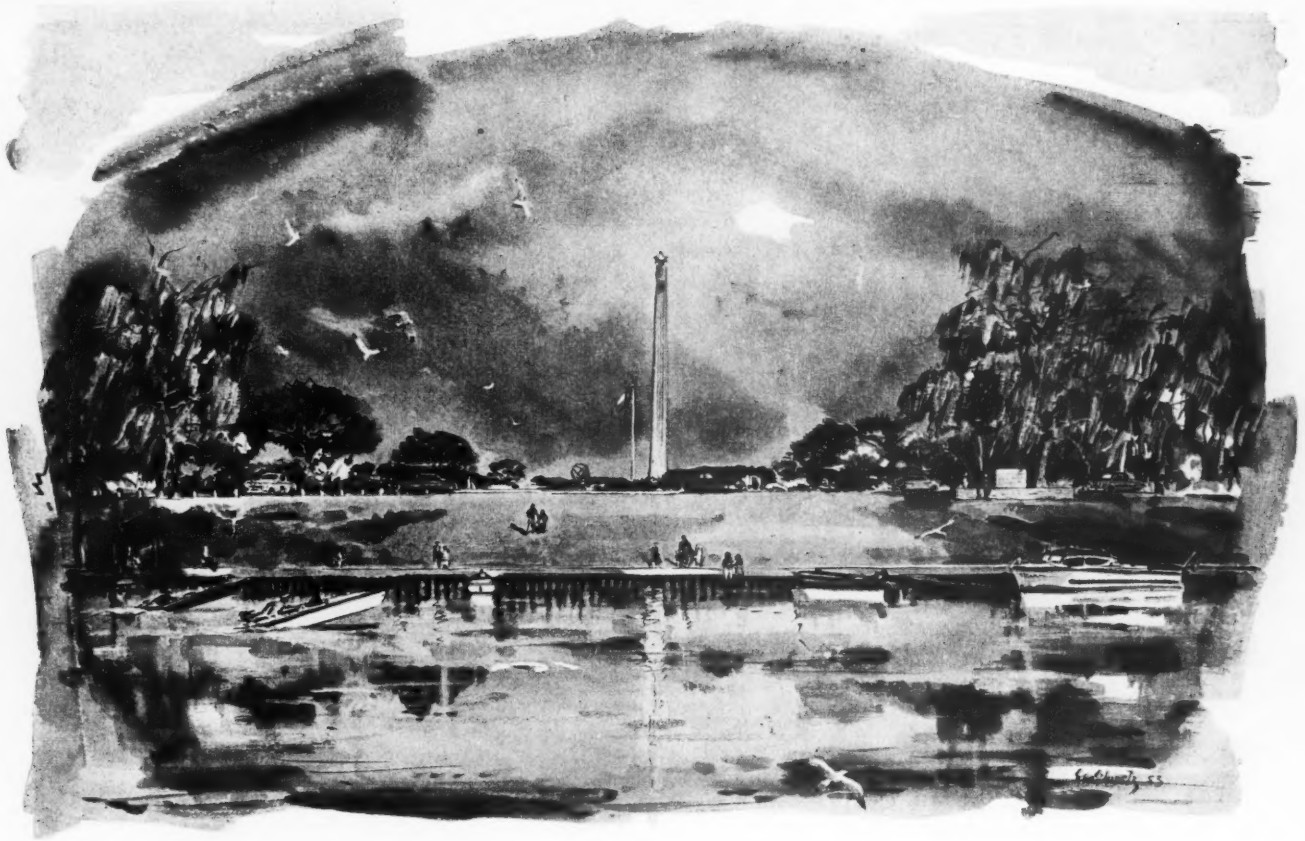
San Jacinto Today

THE San Jacinto Battleground, on the ship channel some 22 miles east of downtown Houston, is today a State Park. It is a favorite picnic spot for families nearby, and a place of interest for students of history the world over. Giving a martial air to an otherwise peaceful place, the battleship *Texas* is permanently moored there, open to visiting thousands.

Stone markers dotting the battlefield bring back scenes of decisive struggle. Here Sam Houston fell wounded, his horse shot dead under him. Over there Santa Anna camped, and under a tree which once grew on this spot the defeated "Napoleon of the West" was brought, a prisoner, before the victorious Houston.

By far the most attractive feature of the battleground for most visitors, however, is the massive 570-foot San Jacinto Monument, topped with a gigantic Texas star and faced with Texas fossilized buff limestone. An elevator inside takes visitors to a lofty observation room. Carvings and inscriptions circling the base of the monument tell the story of the Texas Revolution. Housed inside the base is the popular San Jacinto Museum of History.

The museum is operated for the State of Texas by the



Monument at San Jacinto Battleground *by E. M. Schiwetz*

San Jacinto Museum of History Association, a non-profit educational organization. It was furnished and equipped by public subscription.

Items in the museum tell the story of Texas from its earliest beginnings. Some of the later items bring Texas up to the Civil War period, while others go back to the coming of Spanish explorers. Still others are relics of the ancient pre-conquest period. No visitor can view them without being conscious of the strong links that bound early Texas to Spain and Mexico.

In the Spanish-Mexican Hall stand Indian gods, carved in stone. Here, too, are elaborate examples of ancient art and science, such as Aztec embroidery and a copy of the Mayan calendar. Emblematic of the conquest and exploration period are a pair of *conquistador's* metal stirrups, or *sollerets,* and a huge two-handed sword bearing on its hilt the inscription: *Do Not Draw Me Without Reason; Do Not Sheath Me Without Honor.* Later documents, weapons, and personal memorabilia tell stories of the mission period and Spanish colonial life.

Mementoes of the Mexican Revolution, housed in the museum, outline the progress of Mexico's own struggle for freedom. Among these are handwritten documents and personal effects of men like Hidalgo and Morelos, both priests and leaders of the insurgents against Spain. In one of Hidalgo's notes, he wrote under his signature, with a flourish, "Generalissimo of America." Hidalgo and Morelos were shot by firing squads. In the museum is Morelos' cigar holder, certified by his executioners to have been on his body at the time of his death.

In the Anglo-American Hall, the period of colonization is illustrated by memorabilia of such men as Stephen F. Austin, whose books, calling card, and map of Texas (1830) repose in the museum.

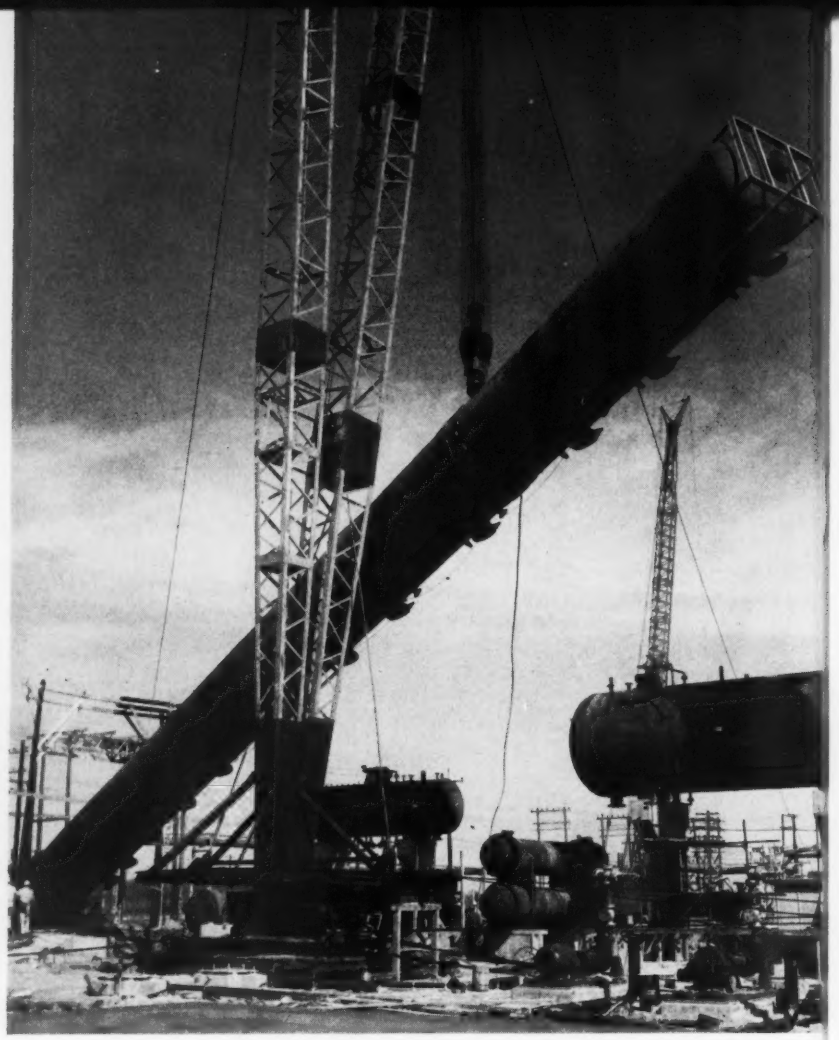
Considerable display space in the museum is given to the period of the Texas Revolution. Encased in glass is a copy of the fiery "Call to Arms," issued in 1835 from Gonzales, often called "The Lexington of Texas." Displays popular with Texas schoolchildren are the uniform, sword, and effects of Sidney Sherman—as well as the uniform of Mexican Colonel Juan Morales. Lying between the tiny bullet that killed John Bricker at San Felipe—the first man of Houston's army to lose his life—and a cannon ball from the battlefield of San Jacinto, is a rusted Mexican bayonet found near Vince's Bayou.

In the Sam Houston exhibit are a lock of "The Raven's" hair, his night cap, gold pen, and spectacles. Here also are the copy of the *Commentaries of Caesar,* which Houston carried with him in his saddle-bags, and his dictionary. Significantly, in his dictionary, Houston had angrily struck out the word "temporize," writing in the margin next to it: "Out with it!"

There, in his own few words, the true character of Sam Houston lies revealed.

the STRUGGLE to Stay Ahead

By H. W. Ferguson
Vice President in Charge of Refining and Sales



Giant tower being raised into position at a new unit under construction at Baytown Refinery. Only one other tower at Baytown plants will be taller.

In the oil refining business, there is no such thing as standing still

IN PETROLEUM refining, as in most other businesses, it is the customer who calls the signals. And if the American consumer is characterized by any one thing, it is an unrelenting demand for more and better products —not just oil products, but everything he buys. The challenge of keeping up with consumer demands is one that Baytown Refinery people have to meet every day of their working lives.

There is no such thing as standing still or keeping one's position in oil refining. You have to go ahead, or you go back. It reminds me of a passage from "Alice in Wonderland." Everyone seemed to be running, but no one appeared to be getting anywhere. Alice, when questioned about it, replied that in Wonderland you had to run fast *just to stay in the same place;* if you wanted to get ahead, you had to run even faster than that! While that may seem like an absurdity, it sums up our refining efforts rather neatly.

Though the struggle to stay ahead concerns work on all products refined at our Baytown Refinery, Esso Extra will serve as a case in point. You remember how it jumped into prominence after World War II; how its quality caught the public fancy and won public acceptance. For a long time after war's end, Esso Extra remained in a class by itself. It does not detract one whit from the fine efforts of the Sales Department to say that the high quality of Esso Extra contributed largely to Humble's ascension to first place among retail gasoline marketers in Texas.

But, as time went on, the day eventually came when the gap between Esso Extra and competitive fuels narrowed. Humble stayed ahead, it is true, but by a less comfortable margin. In the past few months, Esso Extra has been improved still further, responding to the pressure of competition and consumer demand. No doubt you have seen and heard recent advertisements outlining that improvement.

A request by the federal government that a reserve refining capacity be maintained, just as producers have been requested to maintain a reserve producing capacity, has added to the competitive struggle. That request has led to much modernizing of refineries across the nation, others as well as Humble's. Ten years ago, modern units like the huge cat crackers were relatively scarce, found principally in the larger refineries. Now, practically every refinery of any size at all has one or more cat crackers, or is building one. This situation has bolstered the na-

This article has been adapted from an address delivered at the Houston Humble Club's Annual Banquet December 10, 1953.

tional defense, and has contributed to an octane race in which the consumer is the principal beneficiary. For us, it has meant increased costs, considerable additionla investment in equipment, and narrower margins of profit.

Another thing that has contributed to the struggle is the steady improvement in automotive engineering. Today's automobiles are bigger and faster, more powerful than yesterday's—and the trend toward more power continues. Compression ratios are going up, and higher compression ratios require better and better gasolines.

I believe Humble people everywhere would be interested to learn what Baytown Refinery has done, and continues to do, to meet the public's demand for more and better products. To be brief, the Baytown plants have expanded volume, improved technology, increased efficiency, and made better use of manpower.

During the past few years, distillation equipment has been improved by replacing the old-type, less efficient shell stills with modern pipe stills. Five pipe stills are in operation now, and a sixth will be completed by this summer. With pipe stills, more of the higher-value materials can be produced from a barrel of crude oil, and the operation is faster and more efficient.

Other new units now under construction at Baytown will increase capacity at existing units and enable the refinery to increase production of the more valuable materials. I refer to such things as the new deasphalting unit which will increase the amount of charge stock available for catalytic cracking, a second catalytic light ends unit to permit greater recovery of LPG stocks, and a new catalytic polymerization unit that will help make more gasoline.

Most Humble people are familiar with Baytown's production of synthetic rubber from oil, but I believe it should be at least mentioned here. The refinery produces the butyl type rubber for inner tubes and supplies butadiene to another corporation that manufactures the Buna-S type rubber for tires. Brief mention should be made, also, of the former Baytown Ordnance Works, which for a long time during World War II supplied about two-thirds of the synthetic toluene made from oil. Toluene was made into TNT, furnishing the explosives for Allied bombs and shells.

As a result of long-range program now completed, all mechanical shops have been consolidated and brought together under one roof. Shops are now air-conditioned.

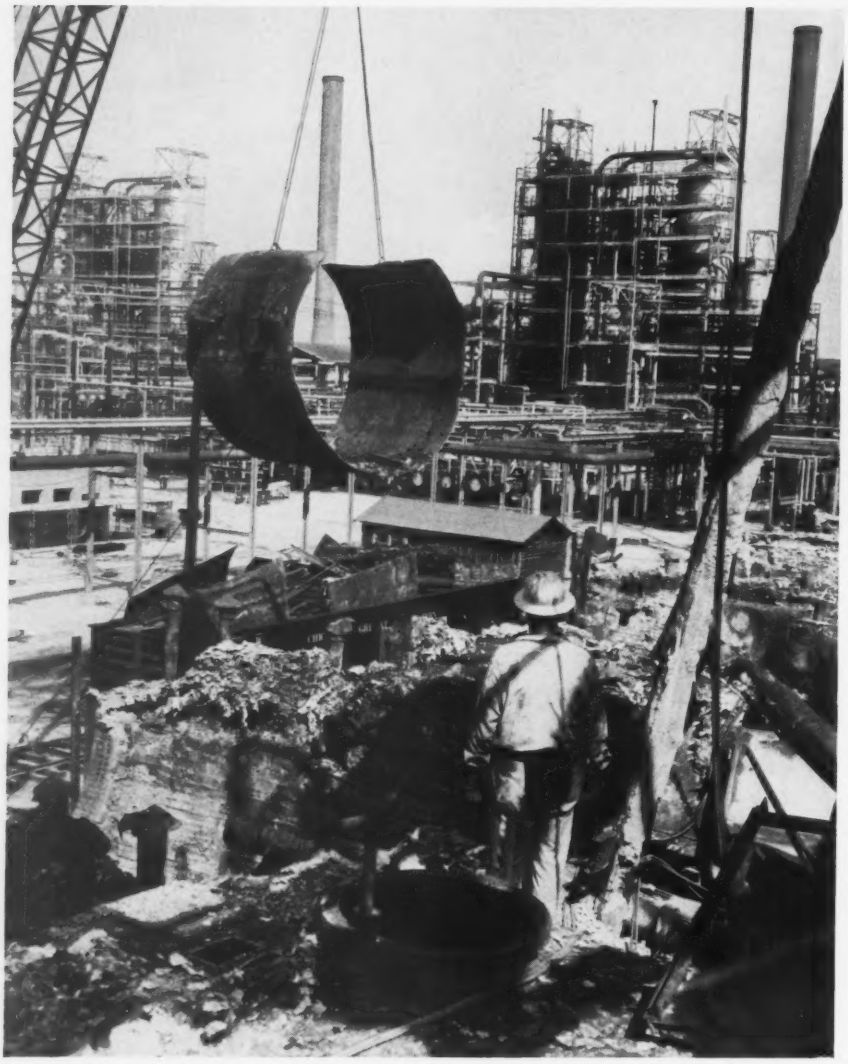
The two rubber plants—the butyl and butadiene plants—have continued at an accelerated pace since the end of World War II. The Baytown Ordnance Works was converted immediately to peacetime production of solvents and materials for high quality gasolines for motor and aviation use.

Along with the customary products —gasolines, lubricants, solvents, jet fuels, specialties, and hundreds of other things—Baytown Refinery has during most recent years ventured into the field of petrochemicals. Mark the word "petrochemicals" well, for you are likely to hear it more and more often as time goes on.

Baytown Refinery manufactures no finished petrochemical products, but does supply some of the raw materials. For example, there is now in operation a unit that produces *paraxylene,* an oil material from which the new synthetic fiber, Dacron, is made. A pound of paraxylene makes a pound of Dacron, and Baytown's unit has a capacity of 31 million pounds a year.

For a considerably longer time than

Wherever it has been shown that new mechanical equipment could do jobs better, save manual effort, and reduce expenses, that equipment has been provided.



Distillation equipment has been steadily improved during the past few years by replacing the old-type shell stills (foreground) with modern pipe stills (background).

Baytown Refinery has supplied paraxylene for Dacron, it has refined and sold *cyclohexane,* an oil material used in the manufacture of nylon. It is quite probable that our venture into the petrochemical field will expand.

In the struggle to stay ahead, improvements and additions have been made in mechanical maintenance work, as well as in process work, at Baytown. As the result of a long-range program now completed, all mechanical shops have been consolidated and brought together under one roof. It is not too wide of the mark to say that this is one of the most superbly equipped and organized mechanical shops in the country. The shops are also air-conditioned, raising the level of working efficiency during hot summer months, as well as providing for employees' comfort and well-being.

Wherever it has been shown that new mechanical equipment of any sort could do jobs better, save manual effort, and reduce operating costs, the equipment has been added. Storehouse stocks have been palletized for quick, easy handling; heavy loads can be moved from one plant site to another quickly and with a minimum of effort by using the spider-looking Ross Carriers and other mobile equipment; the most modern of heavy equipment such as cranes and bulldozers has been provided. All these things make it possible to do things faster and easier than before.

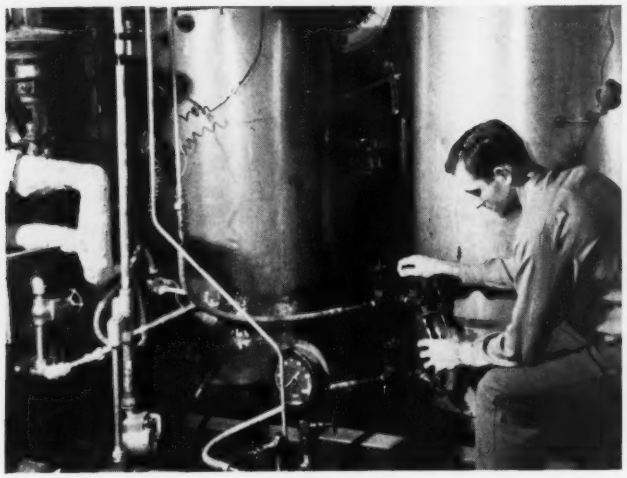
But the use of machines alone does not account for increased efficiency of plant work. More and more emphasis is being placed on proper job planning and coordination of work. We try, as far as possible, to eliminate waste and "lost motion."

A continuous—and I believe a highly successful—training program is carried on for refinery people. Some of the training can be carried out on the job, but a great deal of it takes the form of actual classroom studies and exercises on Company time. Training is provided at all levels and in practically all types of plant work. And, of course, employees themselves are encouraged to take part in Baytown's progress through their suggestions under the Coin-Your-Ideas Plan. We are quite proud of the impressive list of awards made each quarter for those ideas, and prouder still of the benefits deriving from them—benefits to the Company and to the individual.

Continuous research at Baytown is a major part of the plant's effort to stay ahead. We have from our earliest years emphasized research and development work. Back in 1938, we put into operation at Baytown the first commercial alkylation unit in the world. Alkylate, the product of that unit, is the most important component of high-octane aviation gasoline.

As another example of Baytown research, early studies were conducted on solvent extraction, a process essential to the Baytown Ordnance Works. We were among the leaders in the superfractionation process which precisely separates a naphtha charge stock into its fractions, sifting out the higher quality components and making them available for high-octane gasolines. The operation at that unit must be so precisely controlled that even a variation in temperature of only a fraction of a degree can throw the whole thing off balance.

But Baytown cannot rest, and is not resting, on its research laurels. We continue to study alkylation, distillation, catalytic cracking, and other processes to improve them and make them more efficient. Humble people worked out a means of separating paraxylene from a mixture of solvent xylenes, to get out the material needed for Dacron. They have found ways to make alkylate from propylenes and pentylenes, as well as the butylenes from which alkylate was first produced. And they are working on some new research projects, too.



Continuous research is part of Humble's effort to stay ahead. Here is research work on hydrofining, to improve heating oil.

A continuous training program is carried on for people at Baytown Refinery. Here is a classroom study group at work.

One example is desulfurization of gas-oils and naphthas, to increase product quality and decrease corrosion of equipment. Research studies are in progress on hydrofining, to improve heating oil by making it cleaner and better.

To name one of the benefits of an aggressive research program, Baytown is getting more of the higher value products out of every barrel of crude oil. In the old days, we made more fuel oil and less gasoline; today, we make more gasoline and less fuel oil, principally through the work of modern units such as high-vacuum pipe stills and cat crackers.

It is interesting to note at this point, perhaps, one national figure. In 1923, it was possible, on a national average, to make 30 per cent of a barrel of crude oil into gasoline. Today, the average is 46 per cent. The more valuable products a refiner can squeeze out of a barrel of crude oil, the better off he is in the competitive struggle. I can assure you that Baytown is doing all it can in that direction.

Perhaps too much has been said about machines and processes; too little about people. *It is people—not machines—that have put Baytown Refinery in its position of leadership among the nation's refineries.* And it is people, Humble people, who will keep it there.

I want to pay full tribute to the team spirit at Baytown, to the competitive spirit that will not be satisfied with anything less than the position of leader. There exists among Baytown people, as among Humble people everywhere, a willingness to cooperate, a feeling of working together toward a common goal in which the progress of the Company is integrated with the progress of the individual.

Speaking of progress, it is the oil industry's custom to observe a national Oil Progress Week each October. I think Oil Progress Week is a fine thing, but the term seems somehow inadequate. At Baytown Refinery (as indeed we must admit it is in all Company operations) Oil Progress Week is 52 weeks in the year! We cannot let up in our struggle to stay ahead, to keep in front of competition.

And it is not easy. It takes hard work, careful planning, cooperation among all groups, and continuous investment in new facilities. I can with considerable pride express assurance that Baytown Refinery will do everything possible to stay ahead. Its success thus far in the struggle makes a thrilling story to those of us in the Refining Department. I hope I have been able to pass some of that thrill of accomplishment on to you.

It is people—not machines—who have put Baytown Refinery in its position of leadership among the nation's refineries. And Humble people will keep it there.

Foreman looks on as one burner dresses lead pan while another burns flat seam. Helpers (below) cast the burning bars.

Ancient Craft in Modern Use

Baytown's lead burners use one of the world's oldest skills in the refinery's unending fight on corrosion

OF THE many skills required to keep an oil refinery on stream, few can claim an ancestry more venerable than that of the lead burner. Certainly none is the province of a smaller group of craftsmen.

There are only three lead burners at Baytown Refinery. In the entire United States, it is estimated, not more than a thousand men ply the trade. Yet despite the scanty number qualified to practice it, this ancient craft seems to be in small danger of becoming a lost art. For lead burning, both literally and figuratively, carries more weight today than ever before in its history.

What is lead burning? It is really nothing more than the welding of lead, but it is a special kind of welding whose origins date back thousands of years beyond the start of the Christian era. The fusing of lead, says one writer on metallurgy, was an established technique when iron was still little more than a curiosity.

As one of the six so-called prehistoric metals (the others: gold, silver, copper, tin and iron), lead found its way into an amazing variety of practical and ornamental objects. Although lead had no intrinsic beauty, the ancients prized it because it was soft, easily worked, and highly resistant to corrosion.

The Egyptians, their tombs have revealed, used it in jewelry and plates and as a backing for mirrors. The Babylonians sheathed their famous "hanging gardens" with lead to keep in moisture. As early as 2000 B.C. the Chinese made it the main element in their money (an idea later filched by modern counterfeiters). Greek mariners tossed out anchors that were wooden pipes filled with lead.

It was the Romans, though, who made the most versatile use of lead and who brought the lead burning of antiquity to its peak development. They not only "burned" lead by melting it and then pouring it into molds, but they also fused separate pieces by firing charcoal in a brazier and directing its heat onto the joint with a blowpipe—basically the same method as that used today.

The Romans shaped the metal into scores of products ranging from lead knuckles (for the gladiator trade) to funeral urns to water conduits. Some of their lead pipes, more than 2000 years old, have been excavated in modern times and found to be in excellent condition. Because the Latin word for lead was *plumbum,* men who work with water pipes are still called plumbers.

Today, other metals and the up-and-coming plastics have displaced lead in many fields. Its gains, however, have far outstripped its losses. Americans currently buy well over a million tons of lead a year in the form of storage batteries (the biggest chunk of all), cable coverings, tetraethyl additives for gasoline, building materials, and so on. But it is in the chemical

and process industries where most of the lead burners carry on, and it is there that lead has one of its strongest footholds.

Take the case of an oil refinery. No modern refinery could function at anywhere near top efficiency unless certain of its pipes and vessels were able to stave off the corrosive effects of sulphuric acid, a jack-of-all-chemicals in oil treating operations. That is where lead comes in. This soft but tough metal can withstand all but the hottest and strongest of sulphuric acid solutions.

In their unending fight on corrosion, Humble's three lead burners installed some 200,000 pounds of new lead at Baytown last year. At the same time, they carried out repair work on countless other tons of acid-flouting pipes and linings.

Watching a lead burner in action, you might easily jump to the conclusion that it is a pretty simple job. You would never be more wrong. Says one Humble veteran (41 years in the trade): "Anybody can daub lead, but it takes a good man and an experienced one to burn it." With that opinion, the experts on both metallurgy and welding seem to agree.

What makes the work especially tricky is the peculiar nature of the metal. Lead has such a low melting point (621 degrees Fahrenheit) that a lead burner can use only about five per cent as much heat as one would use in welding steel. Because of this, the burner relies on an unusually small torch—he calls it a "finger pipe"—that emits just a sliver of flame.

Lead also expands greatly in the presences of heat, more than twice as much, in fact, as does steel. This increases the danger of stresses cropping up during cooling. The lead burner, therefore, must work from "puddle to puddle," with each bit of molten metal overlapping and solidifying separately If using a "burning bar," which is a welding rod of lead, he lays on just a drop or two of extra metal at a time.

The tendency of lead to take on a coat of oxide from the air poses another problem. Since oxide has a much higher melting point than lead, the lead burner must see to it that both his burning bar and the material being welded and scraped entirely clean before he applies the torch.

The tools of the trade are few in number. At Baytown they include a handsaw and cutting knife for severing the sheets of lead; hardwood "dressers," made of dogwood or lignum vitae, for flattening out the metal; several heart-shaped, razor-edged scrapers for removing oxide; and seven sizes of finger pipes.

To get the clean fire they need, the lead burners at Baytown use a mixture of hydrogen and oxygen. Back in the early days, they made their own hydrogen by soaking a pig of zinc in sulphuric acid. They now get it ready-made in cylinders, but even today a pig or two of zinc may be seen in their shop, holdovers from the lead-burning technique of former years.

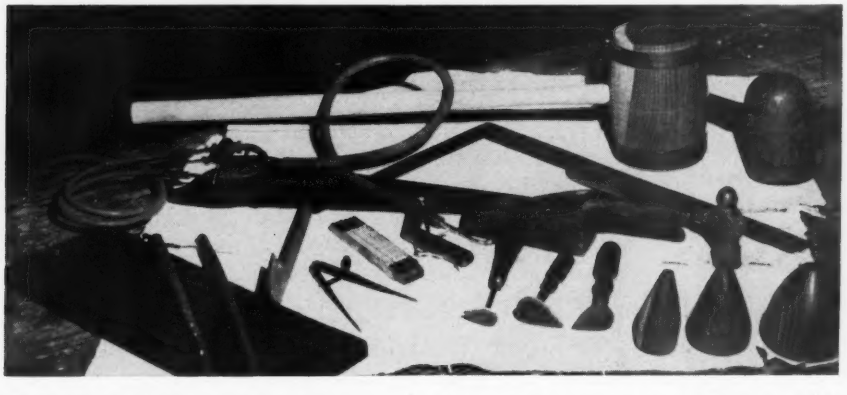
The art of lead burning was for many centuries restricted to a tightly-knit fraternity. It was handed down from master to apprentice, from father to son, or from relative to relative. This tradition of the medieval guilds still survives to some extent, but the growth of the chemical and process industries has widened considerably the field of opportunity for this ancient craft.

Burner taps on a hatchet-like cutting knife to slice lead from rolled sheet.

Baytown's lead burner foreman still remembers the difficulties he had in learning the secrets of the trade. "It was several years before World War I," he says, "and I was waterboy at a sulphuric acid plant in Tennessee. There were only about 40 lead burners in the country then. I had to borrow the tools of those acid plant lead burners, unbeknownst to them, and practice at night on scrap lead. It took many weeks and I lost a lot of sleep, but I finally learned how."

Why did he want to become a lead burner?

"Well," he smiles, "they were paying those fellows $5.25 a day, and that was more than the plant superintendent got. That's when I made up my mind to be a lead burner."



Tools of the trade are shown here spread out on table in lead burners' shop. They include mold for making burning bars, saw, hammer, mallets, and extra-small torch.

Burner puts vertical seam in foamite tank, using tiny torch to fuse metal.

Thirteen employees retire

Of the new annuitants, nine have 26 or more years' service; one has 33

Thirteen long-time employees have retired since the last issue of THE HUMBLE WAY. Of this group, nine have 26 or more years' service.

VERNON J. LAMB, lease pumper-gauger at Raccoon Bend, leads this group of new annuitants in amount of service with more than 33 years to his credit.

HUMBLE PIPE LINE COMPANY

JOHN E. LEAZAR, division engineer in Operating Field, plans to travel in the United States—north in the summer and south in the winter—for the first few years after retiring February 17. Mr. Leazar joined Humble in the Company's Engineering Department working in various locations. He has 28 years' service. His special interest includes hunting and fishing.

Oiler JOHN W. MCCANN at Ingleside Station retired December 22. He started to work for Humble at Texas City as a laborer. From there he moved to Harbor Island in 1931. He has almost 28 years' service with the Company. He likes playing dominoes. He will live in Aransas Pass at the present time.

ZANNIE B. MORGAN, field gauger at Cisco, retired January 1 after more than 20 years with the Company. Working as a pipe liner, telegraph operator, engineer, oiler, head stock gauger, assistant district and field gauger, he spent his career at Olney, Ranger, Cisco, and Winters. He plans to stay in Winters. His special interests are scout work and flowers.

Raising chinchillas is the hobby of CLARENCE M. TOWNSLEY, engineer at Cisco. He retired January 25 after more than 28 years' service. Mr. Townsley started with the Pipe Line Company as an engineer and later worked as laborer, clerk, telegraph operator, dispatcher, chief clerk, and district foreman. Aside from raising chinchillas, he likes sports and cultivating strawberries.

PRODUCTION DEPARTMENT

JAMES H. GILMORE, district electrical foreman at Luling, retired September 28 after more than 26 years' service. He started to work for the Company as lineman at Orange. After working in several other places and in other capacities, he transferred to Darst Creek, Texas, in 1931; he moved to Luling in 1935. He has been working in his present position at Luling since December, 1936. Deer hunting is a favorite hobby, and he takes a lot of pride in his deer rifles. He owns a woodwork shop where he spends time making a variety of articles.

VERNON J. LAMB, lease pumper-gauger at Raccoon Bend, plans to raise cattle and flowers on his 175-acre ranch near Bellville, Texas, after his retirement January 31. He has been with the Company more than 33 years. Mr. Lamb started with Humble at Davis Hill as rotary helper. He later worked as rotary fireman, roustabout, derrickman, tool dresser, roustabout gangpusher, and lease pumper-gauger.

THOMAS R. MCEACHERN, engineer at Pickton Gas Plant, retired January 23 with almost 19 years' service. Mr. McEachern was employed as a gangman at Kilgore. Later he worked in various capacities at London, East Texas, Sugar-

land, Flour Bluff, Tomoconnor, Thompsons, and Pickton Gas Plant. He will live at Conway, Arkansas.

LUTHER H. YOUNG, lease pumper-gauger at London, began his career with Humble as a driller at Smackover, Arkansas. He retired February 15 after more than 19 years' service. He also worked as a rotary helper, fireman, and gauger, before becoming a pumper in 1939. He bought an acre of land and a 5-room cottage four miles south of Kilgore where he will live and pursue his hobbies of gardening and raising rabbits and pheasants.

BAYTOWN REFINERY

PHILIP J. BEDNORZ, guard in the Plant Protection Department, retired December 24 after almost 28 years' service. Mr. Bednorz started at the Refinery as a helper in the Pipe Department. Later he also worked as a watchman in Baytown Ordnance Works before joining the Plant Protection group. After retirement, he plans to repair his home and pursue his hobbies of hunting and fishing.

ONER T. NEUMAN, working shop foreman in the Instrument Department, retired January 26 after almost 26 years' service. Mr. Neuman was employed in the Boilermaker Department as a helper. It was in June, 1947, that he was named working shop foreman. On retiring, he plans to take care of his place at Liberty, Texas, where he owns about an acre of land. At present he is building a smokehouse to care for meat in the "old-time" way. Also, he plans to get in more fishing.

RALPH W. WEAVER, insulation supervisor with almost 32 years' service, retired January 22. Mr. Weaver began his employment in the Laborer Department as a laborer. Later he worked in various capacities in the Insulation Department. He was named insulation supervisor in 1950. Except for about one month spent at Breckenridge Refinery, all of his service has been at Baytown Refinery. His hobbies include hunting and fishing.

HOUSTON OFFICE

Bowling and television are the special interest of ROBERT T. EFFINGER, invoice clerk in the Purchasing Department. Mr. Effinger retired February 18 after more than 30 years' service with Humble. He began at Wortham as a laborer. He joined the Purchasing Department October, 1928. During retirement, he plans to travel and watch TV when not baby sitting with his nine grandchildren.

One of the principal organizers of the present Humble Glee Club in Houston, JOHN H. KOBUSCH, statistical clerk in Sales Market Research, retired February 7 after almost 30 years' service. He began as a clerk in 1924, and he later worked as general clerk and statistical clerk. Mr. Kobusch joined the Humble Band in early 1924, and he played the bass drum in this group until it disbanded. In 1935 he helped organize the Glee Club. He was its first president and the accompanist for several years. He and his band, the Houstonians, furnished music for the Houston Office and Baytown Refinery Humble Club dances. He plans during retirement to fish, grow flowers and shrubs, write music for his own enjoyment, and do some art work in ceramics with his daughter.

Employees Recently Returned From Military Service

ARMY

James P. Griffin	Bayou Sale District
Pedro Reyes	Baytown Refinery
Jesse L. Rice	Katy Gas Cycling Plant

NAVY

Frank W. Cole	Conroe District
Bruce M. Sullivan	London District
Curtis B. Williams	Maurbro District

MARINES

Sammie L. Brown	Greta District

Deaths

Since the last issue of THE HUMBLE WAY, 19 active employees and five annuitants have died.

Active employees who have died are: WALTER W. COX, 36, machinist first at Baytown Refinery, on January 28; ALVIN W. CURTIS, JR., 28, associate geologist in Exploration-Geologic in Southwest Texas, on January 18; QUEET B. GARNER, 61, lease pumper-gauger at Luling District, on December 7; LEE A. GRAHAM, 29, head chainman in the East Texas Division Office, on December 25; JOE S. GRIFFITH, 57, land man in Exploration-Geologic in Southwest Texas, on January 25; LANNIE L. HOLMES, 31, rotary engineman at Odessa District, on December 12; WALTER R. HORN, 53, brickmason first at Baytown Refinery, on January 14; SAMUEL S. INMAN, 28, senior credit clerk in Sales at the Houston Office, on January 10; ERNEST T. JENKINS, 64, lease pumper-gauger at Anahuac District, on December 10; CLARE H. KEAN, 46, senior research specialist in Geophysics Research, on January 20; ROBERT A. LANGLEY, 61, engineer at Lytle Station, on December 16; RICHARD S. MAYS, 22, rotary helper at Greta District, on December 25; KELTON E. MYERS, 37, mechanic second at Alice District, on December 19; LEE ROY RUST, 30, statistician in Exploration-Geologic in the Houston Office, on December 23; THOMAS L. SALTER, 55, roustabout at Livingston District, on December 19; STEPHEN A. SLAUGHTER, 47, helper at Baytown Refinery, on December 18; HERMAN L. SMART, 34, rotary helper at Greta District, on January 23; NICHOLAS B. STEVENS, 56, roustabout gangpusher at Conroe District, on January 6; BEN WOODS, 61, pumper at Odessa District, on January 1.

Annuitants: EDWARD T. CESSNA, 79, pipe liner at Hull Station before his retirement, died on December 9; DANIEL M. ALLEN, 69, stock gauger at Benavides Station before his retirement, died January 26; JOE H. GREGSON, 66, oiler at Satsuma Station before his retirement, died January 24; AUSTIN WADE, 66, roustabout at Maurbro District before his retirement, died on December 13; MAMIE B. WIMBERLY, 65, senior clerk in Land Records and Rentals in the Houston Office before her retirement, died on January 8.

By the way . . .

ADDITIONS TO MEDICAL DIVISION

Snyder

Stroud

Dr. Harvey B. Snyder and Mr. Howard J. Stroud have joined Humble's Medical Division. Dr. Snyder's duties will be those of internist and diagnostician. Mr. Stroud has been employed for the newly created position of Medical Office Administrator.

In announcing the new additions, Dr. V. C. Baird, Humble's Chief Physician, reported that Dr. Snyder has had exceptionally fine training and experience in his field of medicine. Dr. Snyder is a graduate of the University of Pennsylvania Medical School, and was formerly chief resident in medicine at Jefferson Davis Hospital in Houston. He was also a consultant in electrocardiography at the Veterans Administration Hospital in Houston, and has joined in the publication of many medical articles, particularly dealing with research in diseases of the heart and blood vessels.

Dr. Snyder and his wife, Doris, live at 4515 Elm Street in Bellaire. They have two children; Eric 8; and Susan, 7.

Mr. Stroud, the new Medical Office Administrator, has a master's degree in Public Health from the University of Michigan. He was formerly director of public health education for the Atomic Energy Commission at Oak Ridge, Tennessee. More recently, he was director of health education for the city of Houston.

Mr. Stroud and his wife, Crystal, live at 3111 Shenandoah in Houston. They have three children; Richard Kim, 10; Carla Christine, 6; and Eric Walter, 19 months.

CONFERENCE REVIEWS MARKETING LEADERSHIP

Humble's second full year as the leading marketer of tax-paid gasoline in Texas was reviewed by 150 key sales people and executives at the Sales Departments' annual statewide Sales and Cost Conference in Fort Worth, January 25-27.

Since 1946 Humble has climbed from fifth place in marketing operations in the state, holding that position since November, 1951.

But leadership in the highly competitive marketing field is not kept without continuing effort, and this year's annual sales conference was primarily concerned with plans for increased sales and more efficient operations in 1954.

H. W. Ferguson, Vice President in charge of Refining and Sales, summed up the program for the assembled salesmen by declaring "Service is your key to selling more in '54."

Division managers presented facts and figures on last year's operations and set new goals for the year ahead. Other sales people from all over the state made reports on particularly successful local operations in all phases of marketing which might be applied elsewhere.

Sales Manager F. A. Watts closed the conference with an address on "Our Biggest Job," in which he reminded the conferees that a businessman's most important job is understanding and working with people.

Following the state-wide conference similar meetings were held in each Sales division.

THE FRONT COVER

Western scenes have always been a favorite subject of Artist Mark Storm. In the front cover for this issue, he has painted a one-picture story of the friendly relations between ranchers and oilmen.

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Published every other month for employees and stockholders

HUMBLE OIL & REFINING COMPANY

P. O. Box 2180, Houston 1, Texas

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Busy fireman on a wildcat rig takes a cautious look at a fiery furnace. (See "Steam Around the Rig," page 6.)

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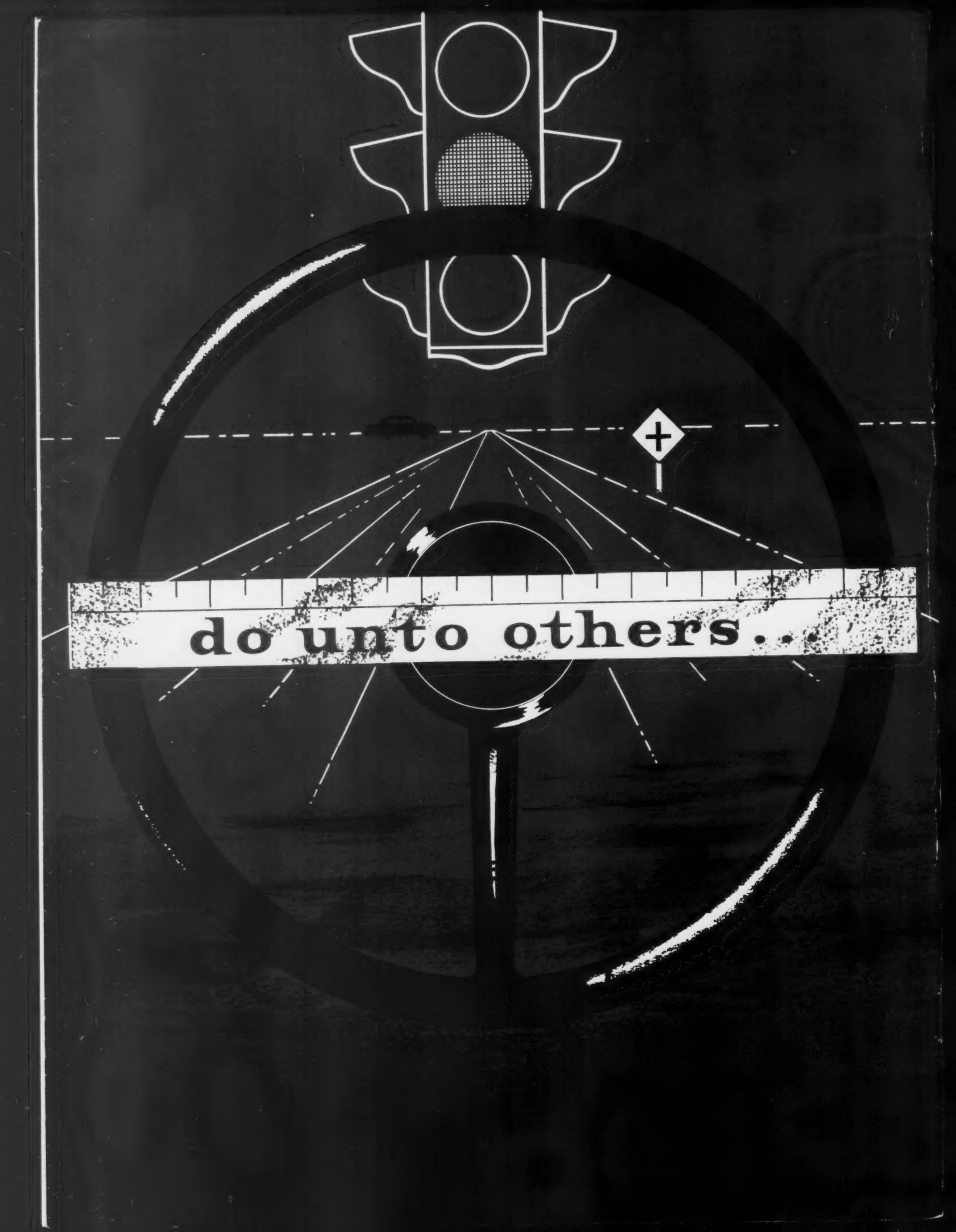
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